EWM100

Processes in SAP Extended Warehouse Management

PARTICIPANT HANDBOOK
INSTRUCTOR-LED TRAINING

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UNIT 1

Warehousing Structures and Master Data

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UNIT OBJECTIVES

- Describe warehouse management systems
- Process a goods receipt in SAP ERP warehouse management
- Process a goods receipt in SAP ERP decentralized warehouse management
- Execute an inbound process in SAP EWM
- Create storage bins
- Display the graphical warehouse layout
- Display a quant
- Transfer master data from ERP to SAP EWM
- Maintain warehouse product master data
- Display a packaging specification

Unit 1
Lesson 1

Differentiating the SAP Solutions for Warehouse Management

LESSON OVERVIEW

This lesson introduces warehouse management systems and the warehouse management solutions offered by SAP. In this lesson, you learn how to process goods receipts and execute inbound processes.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Describe warehouse management systems
- Process a goods receipt in SAP ERP warehouse management
- Process a goods receipt in SAP ERP decentralized warehouse management
- Execute an inbound process in SAP EWM

Warehouse Management

Depending on the number, variety, and diversity of the products you purchase, sell, or produce, you may have different requirements for storing these materials, as the following examples indicate:

- A mining company that digs ore and sends it directly to a refining factory does not need to store the ore. That company does not need a warehouse.
- A factory that refines ore to produce steel needs a simple warehouse to hold the steel until it is sold to a customer.
- A distributor receiving thousands of products from many manufacturers and distributing those products to hundreds of customers needs a complex warehouse. That warehouse needs to facilitate the following tasks, among others:
    - Track the product received
    - Determine the location to store the incoming product
    - Track current stock levels for each product
    - Determine the location to retrieve the product from (before distributing that product)
    - Track the distributed product

Why Use a Warehouse Management System?

Inventory must be stored efficiently to satisfy customer orders and supply production with raw materials.

Warehouse Management means the management of stock and the management of the locations where that stock is stored. When running a business, it is essential to fulfill customer orders without delay. Although it may be difficult to forecast customer-order requirements, you try to have stock for order fulfillment.

Manufacturing plants often use a Just-In-Time model, which means that they hold very little stock in their warehouse. The advantage of this is reduced warehousing costs. The disadvantage is that there may not be enough stock to meet production requirements to fulfill customers' orders. It is very important for a successful business to hold sufficient stock and to avoid that situation.

Figure 1: Warehouses

Warehouse Management System Functions

A Warehouse Management system (WMS):

- Tracks the amount of a particular good or material that is stored in a warehouse.
- Tracks the location of every storage bin that holds a particular good or material.
- Controls and records all movements of goods and materials in the warehouse.

Also, a Warehouse Management system can increase warehouse efficiency. It can provide tools to monitor warehouse activities and to plan resource requirements, for example, warehouse staff or equipment resources, and so on.

Large warehouses with many storage bins and many different goods and materials need a Warehouse Management system to be efficient and satisfy customers' needs. They use a Warehouse Management system to:

- Control the putaway of goods and materials that come into the warehouse. The Warehouse Management system determines an available and suitable storage bin to store the goods or materials.

- Control the picking of goods and materials to leave the warehouse, for example to fulfill an order. The Warehouse Management system determines a stocked and suitable storage bin to pick the material from.

Complex Warehouses
In more complex warehouses, additional functionality can be provided to manage other information or services related to goods and materials, for example:

- Serial number
- Batch number
- Minimum shelf life
- Vendor managed inventory (VMI)
- Yard Management
- Value-added services (VAS)

Examples of warehouses with this level of complexity include distribution centers or logistics service providers. Warehouses become more complex as they become responsible for value-added services (VAS) tasks, for example, packaging.

When knowing the quantity of your stock (without knowing the location of that stock and other information) is insufficient, then you know that you need a Warehouse Management system.

SAP Warehouse Management Solutions

Business Solutions

With the availability of SAP Extended Warehouse Management (EWM) as strategic WM application, it is important to decide which warehouse management application is best for your business. Which of the available SAP solutions is the right one for your needs?

SAP Warehouse Management (WM), part of SAP R/3 (version 2.0), was released in 1993, and SAP has continuously improved SAP WM from release to release. The introduction of SAP EWM in 2005 did not directly replace the SAP WM system. Instead, it provided an alternative for warehouses that required the functionality available in SAP EWM.

However, the customer must be aware that the end of mainstream maintenance for SAP Business Suite 7 core releases also means that for SAP WM as part of SAP ERP 6.0, maintenance ends in 2027 (see note 1648480 – Maintenance for SAP Business Suite 7 Software).

SAP S/4HANA, the next generation ERP solution from SAP, includes SAP WM and since SAP S/4HANA 1610, it also includes embedded EWM. SAP WM is part of a compatibility pack and can be used in its current version until the end of 2025. For details see the SAP Note 2269324 - Compatibility Scope Matrix for SAP S/4HANA on-premise. It is then directly replaced by **Stock Room Management**in SAP S/4HANA. For details see SAP Note 2270211 - S4TWL - Warehouse Management (WM) and 2881166 - FAQ : Stock Room Management.

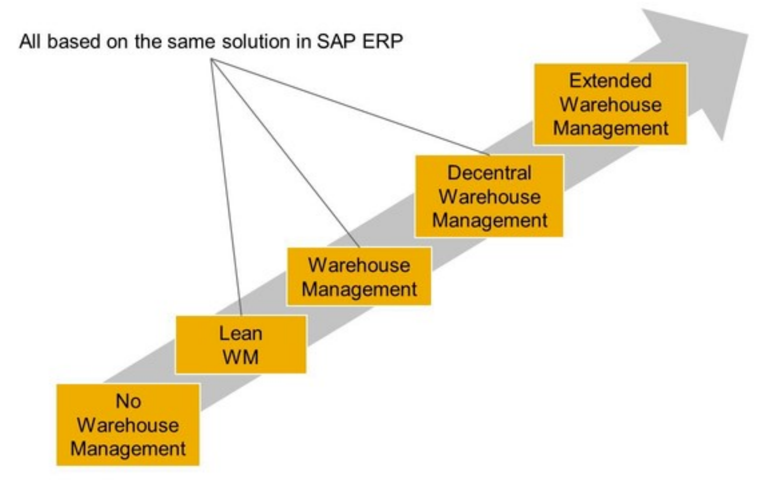

All based on the same solution in SAP ERP
No Warehouse Management
Lean WM
Warehouse Management
Decentral Warehouse Management
Extended Warehouse Management

Figure 2: SAP Warehouse Management Solutions

SAP ERP Warehouse Management

Main Functions of Warehouse Management

- Managing inventory at the storage bin level
- Mapping and control of all goods movements with transfer orders
- Monitoring the processing of all goods movements (with the Warehouse Activity Monitor)
- Connecting to mobile data entry as part of an integrated radio frequency solution
- Connecting to specialized external systems (for example, an automated warehouse system) using an interface

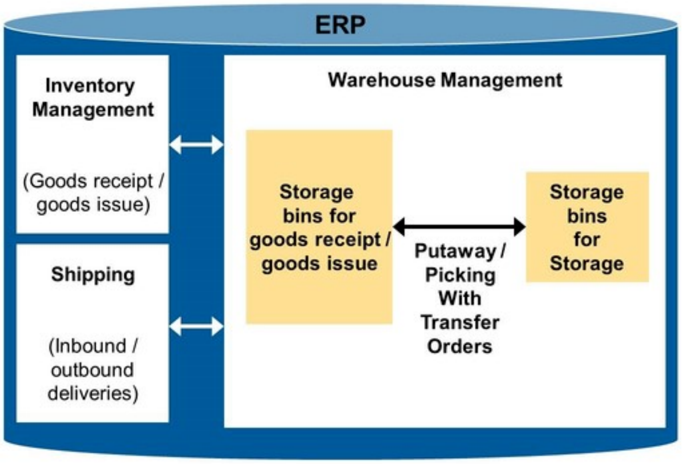

ERP
Inventory Management
(Goods receipt / goods issue)
Shipping
(Inbound / outbound deliveries)
Warehouse Management
Storage bins for goods receipt / goods issue
Putaway / Picking With Transfer Orders
Storage bins for Storage

Figure 3: Warehouse Management in ERP

Warehouse Management (LE-WM) will be replaced by Stock Room Managementin SAP S/4HANA. Stock Room Management reuses major parts of LE-WM and can be used beyond

2025. Task and Resource Management (WM-TRM), Warehouse Control Unit interface (WM-LSR), Value Added Service (WM-VAS), Yard Management (WM-YM), Cross-Docking (WM-CD), Wave Management (WM-TFM-CP), and decentral WM (WM-DWM) are not part of Stock Room Management.

Lean WM is a simplified version of WM. Both are based on the same principles, but Lean WM does not manage the inventory at the storage bin level. Lean WM is a good solution for a customer which has only a limited number of materials and uses only a fixed bin strategy.

ERP Decentralized Warehouse Management

Especially in warehouses with a high throughput, the Warehouse Management system must always ensure quick response times. If the Warehouse Management system runs on the same machine as the ERP system, performance problems may arise.

Also, at some warehouses, the WMS must be available 24 hours a day. This is regardless of whether other systems are available or not.

24-hour availability must be combined with a low risk of downtime. This is to ensure that the WMS can perform all logistics processes, which are often closely integrated.

For these reasons, you can install an SAP system as an independent, decentralized Warehouse Management system to receive requests for goods movements from any Enterprise Resource Planning system.

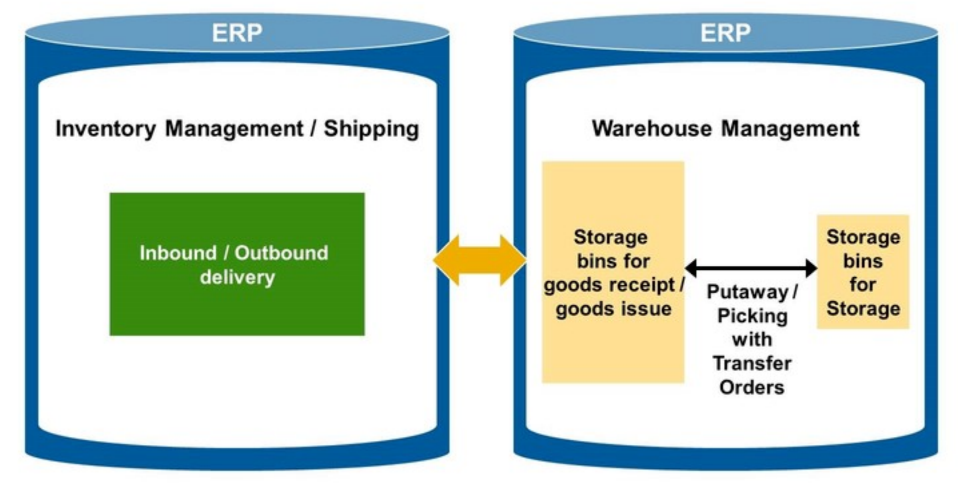

ERP
Inventory Management / Shipping
Inbound / Outbound delivery
ERP
Warehouse Management
Storage bins for goods receipt / goods issue
Putaway / Picking with Transfer Orders
Storage bins for Storage

Figure 4: Decentralized Warehouse Management

Technically the system for Inventory Management / Shipping can also be an SAP S/4HANA system, which is connected to an ECC system as warehouse management solution.

Decentralized WM

In a decentralized WM, the WM is logically or physically separated from the ERP System, therefore:

- The ERP system manages processes, for example the creation of sales orders, purchases orders, and the corresponding deliveries.
- The decentralized WM manages warehouse processes, for example goods receipt, storage, goods issue, and monitoring warehouse activities.

Although the WM is separate from the ERP System, communication is essential. This is achieved as follows:

- Inbound and outbound deliveries (in the ERP system) are replicated using Business Application Programming Interfaces (BAPIs) to the decentralized WM system.
- Goods movement, once finalized or "posted" in the decentralized WM, are replicated using BAPIs to the ERP System.

Warehouse Management Functions and Processes in SAP EWM

In 2005, SAP released its Service Parts Management (SPM) solution. SAP Extended Warehouse Management (EWM) was an integral component of this solution.

Today, SAP EWM is considered a standalone application that can be used in any warehousing environment. It does not require any connection to SPM. Since the introduction of SAP EWM, SAP has continuously enhanced the product.

From an ERP point of view, SAP EWM is a decentralized WM solution. This means that inbound and outbound deliveries are mandatory.

The SAP EWM primary functions are:

- Inventory management at storage bin level
- Storage bin determination for incoming goods
- Stock removal for outgoing goods
- Stock transfers
- Physical inventory management

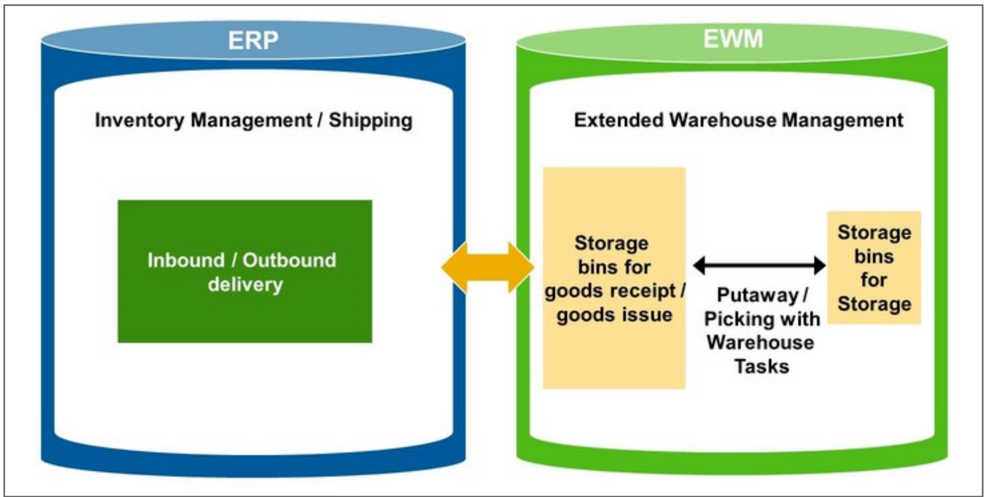

ERP
Inventory Management / Shipping
Inbound / Outbound delivery
EWM
Extended Warehouse Management
Storage bins for goods receipt / goods issue
Putaway / Picking with Warehouse Tasks
Storage bins for Storage

Figure 5: SAP Extended Warehouse Management

Also the embedded EWM in SAP S/4HANA is technically a decentralized solution. So even if there are no separate systems as in a decentralized setting, the inbound or outbound delivery is "distributed" from one part of the system to the other.

Additional Functions for Warehouse Management

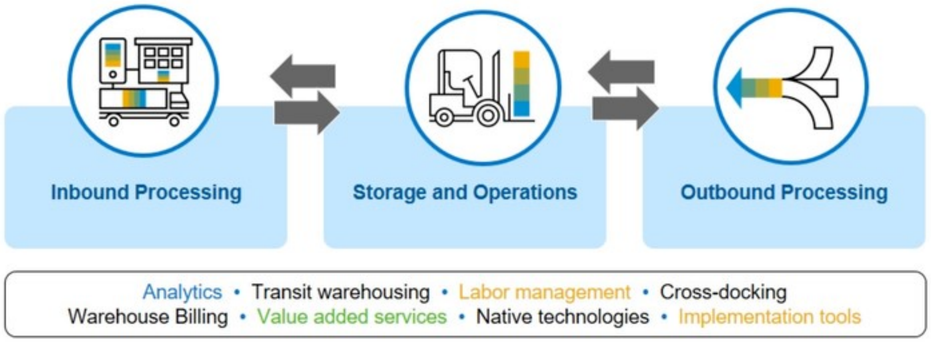

Inbound Processing
Storage and Operations
Outbound Processing
Analytics • Transit warehousing • Labor management • Cross-docking
Warehouse Billing • Value added services • Native technologies • Implementation tools

Figure 6: Extended Warehouse Management Processes

Along with the primary functions, various additional functions are provided to improve warehouse management:

- Slotting
- Consolidation and deconsolidation
- Cross-docking
- Yard management
- Complex internal routing
- Value-added services (VAS)
- Labor management
- Radio frequency identification
- Kit-to-stock / Kit-to-order

The warehouse management monitor is another powerful tool. This tool allows you to do the following tasks:

- Supervise and deal with your warehousing documents and processes
- Check your stock and storage bins
- Monitor your employees and resources
- Check the warehouse workload
- Supervise the material flow system (MFS)

SAP EWM for Complex Supply Chain Networks

SAP EWM is designed for the management of complex supply chain networks. It can be used for warehouses or distribution centers with:

- High throughput of various goods with differences such as:
  - Size

  - Weight
  - Serial number
  - Country of origin
  - Batch
  - Valuation
- Complex cross-docking and order-fulfillment requirements
- Detailed packaging and shipping logistics requirements

EWM System Environment and Deployment Options

The Extended Warehouse Management system, as an application in the SAP SCM solution, is designed as a decentralized warehouse management system. Originally, it was build on the SAP SCM platform and could be deployed together with Advanced Planning and Optimization (APO) or Global Available-To-Promise (Global ATP) on one system. SAP EWM 9.5 was the last version based on the SCM platform. The successor release is based on an SAP S/4HANA system and can be used as an embedded or a decentral version.

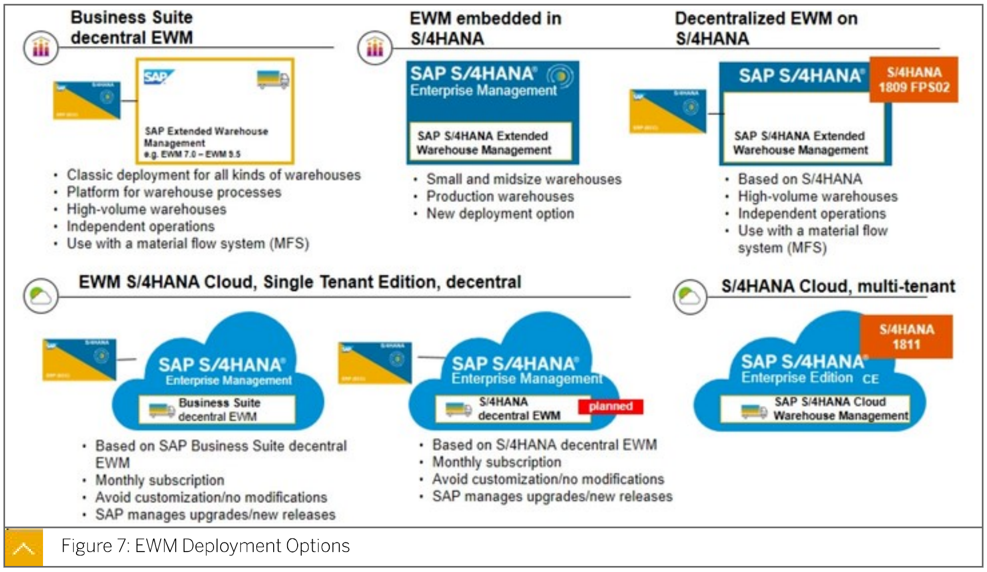

Business Suite decentral EWM
SAP
SAP Extended Warehouse Management e.g. EWM 7.0 – EWM 9.5
• Classic deployment for all kinds of warehouses
• Platform for warehouse processes
• High-volume warehouses
• Independent operations
• Use with a material flow system (MFS)
EWM embedded in S/4HANA
SAP S/4HANA® Enterprise Management
SAP S/4HANA Extended Warehouse Management
• Small and midsize warehouses
• Production warehouses
• New deployment option
Decentralized EWM on S/4HANA
SAP S/4HANA®
S/4HANA 1809 FPS02
SAP S/4HANA Extended Warehouse Management
• Based on S/4HANA
• High-volume warehouses
• Independent operations
• Use with a material flow system (MFS)
EWM S/4HANA Cloud, Single Tenant Edition, decentral
SAP S/4HANA® Enterprise Management
Business Suite decentral EWM
• Based on SAP Business Suite decentral EWM
• Monthly subscription
• Avoid customization/no modifications
• SAP manages upgrades/new releases
SAP S/4HANA® Enterprise Management
S/4HANA decentral EWM
planned
• Based on S/4HANA decentral EWM
• Monthly subscription
• Avoid customization/no modifications
• SAP manages upgrades/new releases
S/4HANA Cloud, multi-tenant
S/4HANA 1811
SAP S/4HANA® Enterprise Edition CE
SAP S/4HANA Cloud Warehouse Management

Figure 7: EWM Deployment Options

Which ERP system can be connected depends on the SAP EWM version. When using a SAP Business Suite based decentral EWM, the EWM system can be connected to SAP systems from R/3 4.6C and higher (including SAP R/3 Enterprise and all subsequent SAP ERP releases) or any SAP S/4HANA system. A decentral EWM based on SAP S/4HANA 1909 requires a SAP ERP 6.0 EhP 5 or higher, or SAP S/4HANA OP1611 or higher. Depending on the release of the ERP system or any Enhancement Packages installed, certain functions or processes in SAP EWM might be unavailable. Details are described in the release notes, installation guides, and notes.

Since SAP S/4HANA 1610 EWM is technically included as embedded EWM, this means that no separate installation is necessary. That approach has certain advantages, but also restrictions that must be considered.

For details of the different deployment options, and the aspects to be considered, please see the SAP note “1606493 – SAP EWM deployment options best practices” . The major differences between embedded EWM in SAP S/4HANA 1909 and a de-central EWM are described in SAP note "2806070 - SAP S/4HANA 1909: Release information and restrictions for EWM in SAP S/4HANA" and "2840129 - Release information and restrictions of Decentralized EWM on S/4HANA 1909" . Please check for further notes related to subsequent releases.

> Note:
> The slide above also includes information about EWM in SAP S/4HANA Cloud, Single Tenant or Multi Tenant Edition, which is not part of this course.

SAP Business Suite Warehouse Management Options

It is possible to use different warehouse management solutions in parallel in your ERP system. There are three organizational units which together controls how the stock is managed.

The **plant** is an operational facility within a company (e.g. a production facility, regional or branch office) and the highest organization unit in logistics. The plant subdivides an enterprise from the viewpoints of production, procurement, maintenance, and materials planning.

The **storage location**is an organizational unit allowing the differentiation of material stocks within a plant. Material always belongs to a combination of plant and storage location.

A physical warehouse is defined under a single **warehouse number**. Using the warehouse number, you can manage several individual warehouse buildings that, together, form a complete warehouse complex.

Through the assignment of a combination of plant and storage location to a warehouse number and the settings for this warehouse number, you define the type of warehouse management you use.

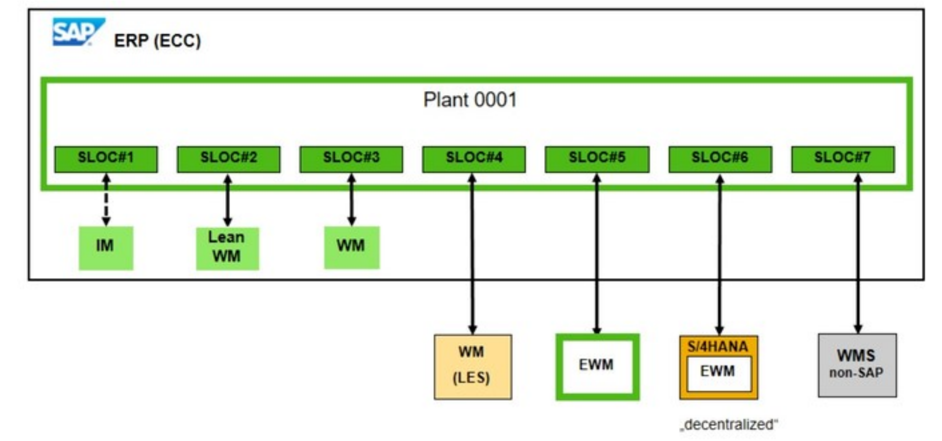


Figure 8: ERP Warehouse Options

- #1: If no warehouse number at all is assigned, you only manage stock on plant and storage location level (inventory management).
- #2: You have a warehouse number and define it as Lean WM. In Lean WM you have no stock on bin levels, but you can create transfer orders for picking and putaway with fixed bins.

- #3: You maintain the warehouse number with the available settings in ERP customizing, with warehouse structures, strategies, etc, and use the full warehouse management features.
- #4, 5, 6, 7: The warehouse number is setup as decentral warehouse, either connected to an ERP based WM (as described in this lesson), connected to EWM, either based on SCM or on SAP S/4HANA, or connected to an non-SAP based warehouse management system.

SAP S/4HANA Warehouse Management Options

The basic definitions for logistic organizational structures (plant, storage location, warehouse number) in SAP S/4HANA are the same as in SAP Business Suite ERP. Through the inclusion of embedded EWM in SAP S/4HANA, there are additional options for the warehouse management solution.

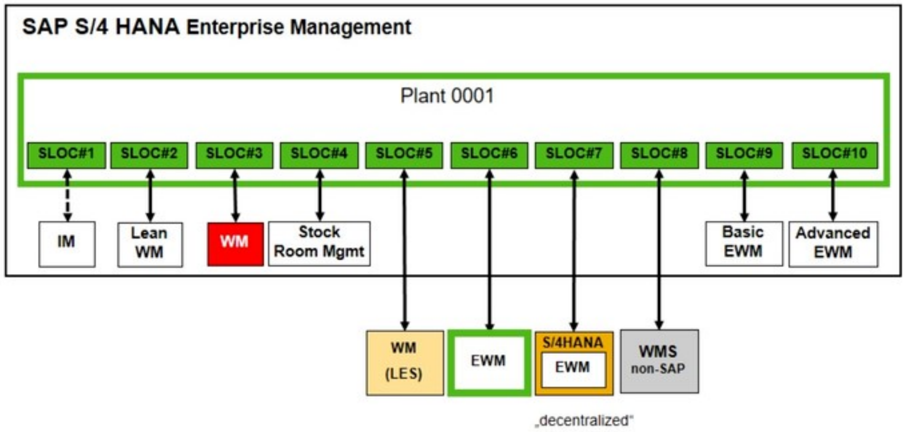


Figure 9: SAP S/4HANA Warehouse Options

- #1: Of course it is not required to use a warehouse management system, so you can continue to use only inventory management for a combination of plant and storage location. That means you have no warehouse number.
- #2: Lean WM is possible as option in a warehouse number.
- #3: As part of the compatibility packs it is possible to use WM in SAP S/4HANA until the end of 2025.
- #4: Stock Room Management reuses major parts of LE-WM and can be used beyond 2025. For details about this solution see the SAP Note 2270211 - S4TWL - Warehouse Management (WM).
- #5: This option would mean that you use a decentral WM, based on SAP Business Suite. The planned availability for this option is until the end of 2027, when the SAP Business Suite solution mainstream maintenance will end.
- #6, 7, and 8: The warehouse number is set up as decentral warehouse, either with an EWM based on SCM or on SAP S/4HANA, or with a non-SAP warehouse management solution. What needs to be considered is the mainstream maintenance for the SCM based EWM, which is planned to end 31.12.2025 (for SAP EWM9.5).

- #9 and 10: In SAP S/4HANA, you can used embedded EWM either as Basic Warehouse Management or Advanced Warehouse Management. The details are described in the Feature Scope Description of your SAP S/4HANA Release.

> Note:
> The slides above always show a combination of one plant and storage location with one warehouse number. But a warehouse number can be connected to several plant and storage location combinations, with the same plant or also with other plants.

LESSON SUMMARY

You should now be able to:

- Describe warehouse management systems
- Process a goods receipt in SAP ERP warehouse management
- Process a goods receipt in SAP ERP decentralized warehouse management
- Execute an inbound process in SAP EWM

Unit 1
Lesson 2

Outlining Organizational Structures

LESSON OVERVIEW

In this lesson, you learn about organizational structures in warehouse management. We look at different types of organizational units and their component parts. You learn how to create storage bins and use the graphical warehouse layout.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create storage bins
- Display the graphical warehouse layout
- Display a quant

Organizational Units in SAP ERP

Since SAP EWM is connected to an ERP system, there are organizational units that we must consider to be in both (ERP and EWM). Inventory management takes place in the ERP system and stock is stored in a plant at storage location level.

A **plant** is a location where goods are produced (manufacturing plant) or stored (distribution center) and where services are provided. A plant is assigned to a company code, which is a Financial Accounting organizational unit. Storage locations are assigned to a plant and keep the stock in view of inventory management. Because of this, at least one storage location is necessary.

Storage Locations in a Plant

Various storage locations in a plant allow you to:

- Differentiate between the various stocks of material in a plant
- Differentiate between the physical storage characteristics
- Classify the quantities of material in a plant to indicate their use (for example, available for sale) or perhaps their logical location (for example, at a third-party logistics provider).

A storage location does not include any physical substructures. This is done with a **warehouse number**. A warehouse number can refer to a single building, or several individual warehouse buildings, that together, form a complete warehouse complex.

Although SAP EWM is very different than SAP WM, both use a warehouse number to represent the physical warehouse in which materials are stored and managed. This warehouse number must be created in ERP customizing. In the case of the use as an SAP EWM warehouse, a substructure does not need to be configured for this warehouse in ERP. Therefore, the ERP warehouse number is set up as SAP EWM relevant, and connected to a warehouse number that is defined in SAP EWM. In the ERP system, the warehouse number is a three-character field. However, in SAP EWM, it is a four-character field.

These organizational units and structures are generally the same in SAP S/4HANA.

Organizational Units

To activate warehouse management in the ERP system, a plant and a storage location (for that plant) is linked with the respective warehouse number.

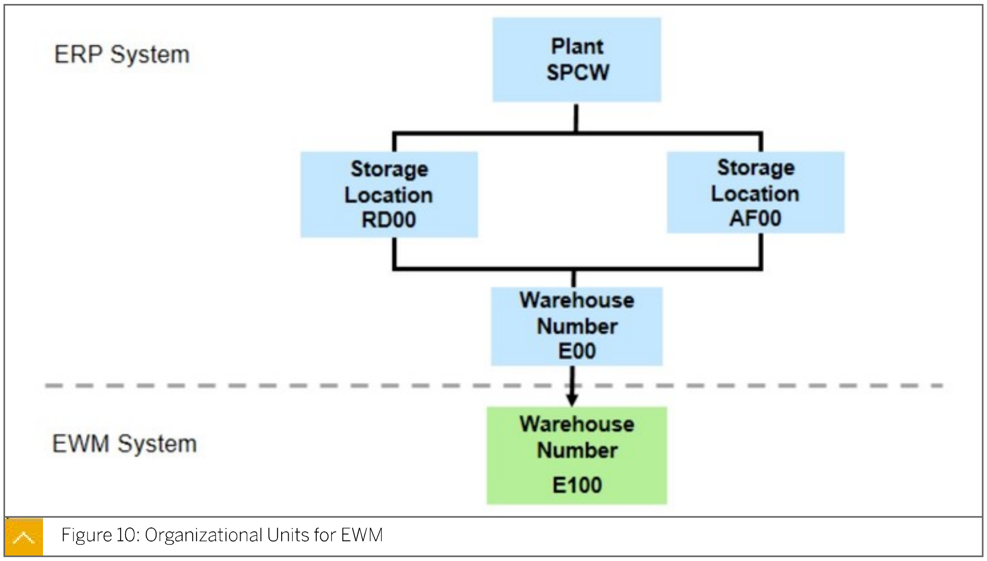


Figure 10: Organizational Units for EWM

Storage Locations

In our training system, two different storage locations are used:

- AF00 (Available for sale)
- RD00 (Received on dock)

RD00 is used to track stock that is in the process of putaway, for example, these quantities are not yet physically available. When the product is finally stored in its destination storage bin, a transfer posting changes the stock storage location from RD00 to storage location AF00. The ROD / AFS scenario is described as standard scenario for SAP EWM and that is why we use it, but it is not necessary that customers use this setting in their warehouse. On the other side customers might want to use several other storage locations in parallel inside the same warehouse. This is also possible, but then a distinction between incoming stock and stock which is already putaway in the final bin could not be done.

Organizational Units in SAP EWM

The warehouse number is the highest level of organizational unit in warehouse management. In practice, the warehouse number usually corresponds to a physical building or distribution center. Each warehouse number has a substructure that maps the spatial relationship in the warehouse complex in detail.

There are different forms where products are physically stored in a warehouse. These forms, called Storage Types include:

- Various types of racks
- Any open storage space
- Goods receipt areas

- Goods issue areas

Storage types are represented as a group of warehouse bins with similar characteristics. Storage types are defined on the basis of their spatial or organizational features.

Storage sections are subdivisions of a storage type. A storage section represents a group of bins that have a common attribute, for example, bins that are used to store fast-moving items. Storage sections are used when determining the putaway storage bin.

Storage bins are the lowest level of organizational structure. They are assigned to a storage type and a storage section (if one exists). Storage bins represent the physical location where the goods are stored in the warehouse.

When you store a product in your warehouse, you need to know exactly where it is stored, that is, the storage bin. The coordinates of the storage bin indicate the precise position in the warehouse. Storage bins are master data.

Warehouse Number

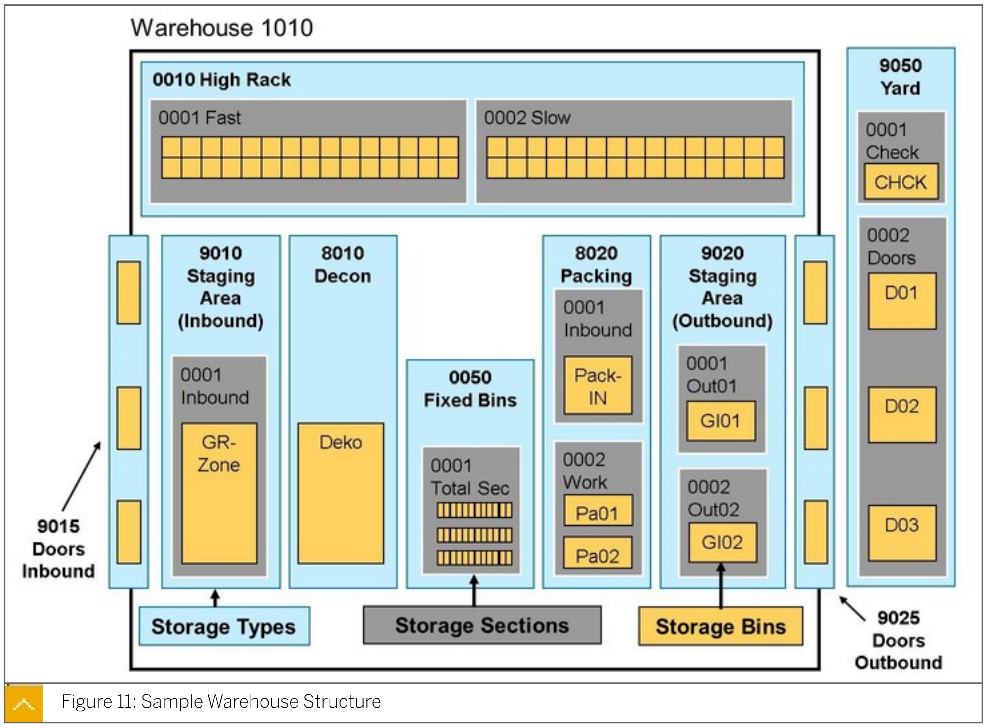


Figure 11: Sample Warehouse Structure

The organizational and physical attributes of a warehouse building are entered under the warehouse number in Customizing. Examples of some attributes are:

- Weight unit of measure
- Volume unit of measure
- Time unit of measure

There are also various determination procedures for palletization data and packaging specifications that are assigned at the warehouse number level.

SAP recommends using one warehouse number for each group of storage areas or buildings (warehousing complexes) in the same geographical area. If your warehousing facilities are located in different cities or are physically separated by a long distance, it is appropriate to assign a separate warehouse number to each warehouse complex.

Each warehouse number must be assigned to a unique Supply Chain Unit (SCU). An SCU is a physical or organizational unit that is used within a logistics process in the form of one or more business characters. The supply chain unit contains essential information, such as country, region, and time zone. The system uses the time zone for the warehouse number when displaying all date and time fields.

Storage Type

A storage type is a physical or logical subdivision of a warehouse complex. It is characterized by:

- Warehouse technologies
- Space required
- Organizational form or function

The storage type is a four character code that is defined when customizing SAP EWM. Storage types have a storage type role that defines what they are used for.

Storage Type Role and Purpose

Storage type roles and their purposes are outlined in this table.

Table 1: Storage Type Role and Purpose

Storage Type Role	Purpose
Standard Storage Type	A physical area in the warehouse where products are stored. SAP has pre-configured a number of standard storage types.
Identification Point	An area within a warehouse where goods are labelled, identified, and/or checked during the putaway process.
Pick Point	A physical area within the warehouse where goods are checked, labeled, inspected, and/or packed during the goods removal process.
Identification and Pick Point	An area within a warehouse where both identification (Identification Point) and picking (Pick Point) takes place.
Staging Area Group	A material staging area, or many material staging areas, in the warehouse.
Work Center	A physical area within the warehouse where processes such as deconsolidation, inspection, packing or value added service processing take place.

Storage Type Role	Purpose
Doors	A door or many doors is a certain physical location within a warehouse, for example, the doors to the west of the warehouse.
Yard	A yard adjacent to the warehouse.
Automatic Storage Retrieval (Material Flow Control)	An area using automated storage and/or retrieval, for example, as a conveyor system.
Automatic Warehouse (Controlled by MFS)	An automated high-rack storage area with a stacker crane.
Work Center in Staging Areas Group	A work center within a material staging area.
Production Supply	An area where products for the production are staged, near the production line.

Essential settings regarding putaway, stock removal or goods movement control are configured in the storage type customizing.

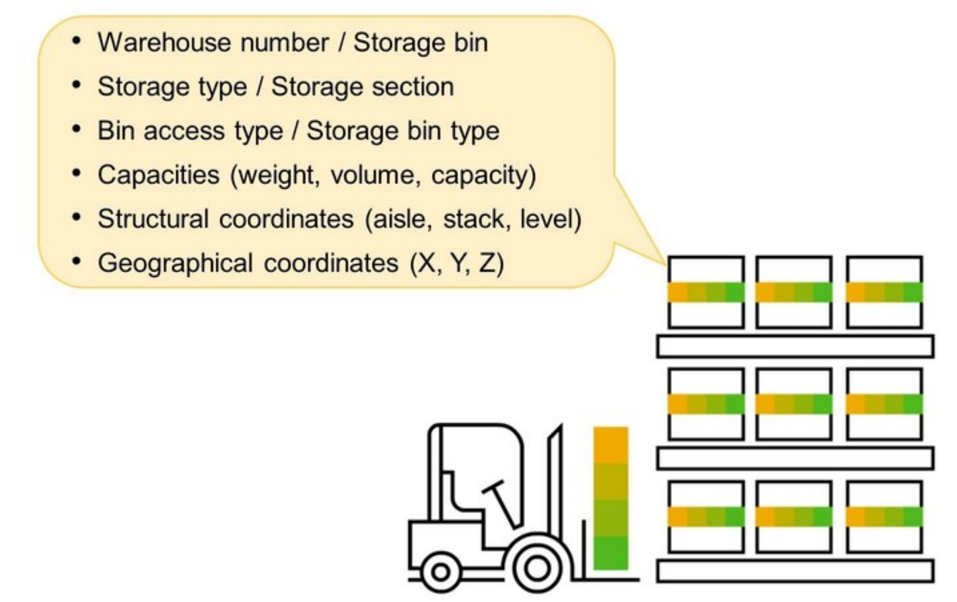
Storage Section

A storage section is an organizational subdivision of a storage type. It joins storage bins that have similar attributes. This information is then used during the putaway process. The criteria for joining these bins (or the attributes of the bins) can be defined in any way, for example:

- Heavy parts
- Bulky parts
- Hazardous materials with certain characteristics
- Fast-moving items
- Slow-moving items

Storage Bins

A storage bin is the smallest addressable unit of space in a warehouse and it represents the exact position in the warehouse at which a product can be stored.



- Warehouse number / Storage bin
- Storage type / Storage section
- Bin access type / Storage bin type
- Capacities (weight, volume, capacity)
- Structural coordinates (aisle, stack, level)
- Geographical coordinates (X, Y, Z)

Figure 12: Storage Bin

Customizing Storage Bin Coordinates

As the address of a storage bin is frequently derived from a coordinate system, that address is called a bin coordinate. A bin coordinate is 18-characters in length, for example, the coordinate 01-02-03 would be a storage bin in aisle 1, stack 2, and level 3. Note that the bin coordinate assigned to a storage bin is unique within the warehouse.

In customizing storage bin coordinates, there are two steps:

1. Define the bin coordinate structure or "coding" by assigning a unique character to represent these components of the bin coordinates:
   - Aisle
   - Stack
   - Level
   - Bin subdivision
   - Bin depth
2. Use this coding to create templates to generate the storage bin master data automatically.

You can use any combination of letters and numbers for storage bin coordinates. Ensure that you organize each part of the structure according to the coding defined for your warehouse (for aisle, stack, level, and so on).

Storage Bins, Types and Sections

Each storage bin must be assigned to a storage type and can be assigned to a storage section.

You can also define additional attributes for a storage bin such as:

- Storage bin type: Used to indicate the relative size of a bin and/or actual bin dimensions
- Bin access type: Used to control how a bin is accessed by resources
- RF verification field: Used in (radio frequency) RF scanning to verify that the correct bin is being accessed
- Geo-coordinates of storage bin: Used by SAP EWM to compute distances between the bins in goods movements
- Capacity checking attributes (max weight, volume, total capacity): Used to control the amount of product assigned to a bin
- Fire containment section: Used in product hazardous material reporting

Activity Area

Warehouse activities, for example putaway, picking, and physical inventory, are executed in activity areas. This allows the sequence of warehouse tasks to be optimized according to the assignment of storage bins to an activity area.

You create activity-dependent bin sortings within an activity area.

An activity area consists of one or more assigned storage bins. Depending on the activity, the same storage bin can be assigned to multiple activity areas. For each activity, the assigned bins are sorted per activity area.

For the sorting, you use information from the storage bin, such as, the aisle, the stack, or the level as sort criteria.

To optimize the picking or putaway process, storage types are logically grouped using the activity area.

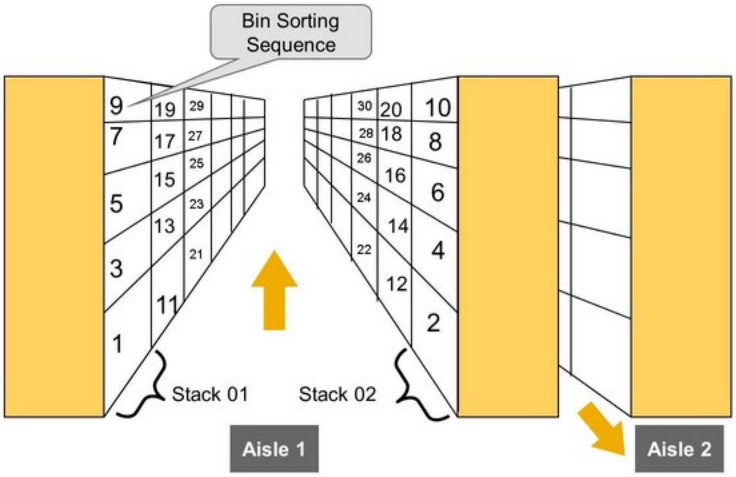


Figure 13: Storage Bin Sequencing Through Activity Areas

Staging Areas

After unloading or before loading, material can be stored in an interim storage known as the staging area.

A staging area defines a storage section of a storage type with role “D”. ("D" indicates a staging area group).

You must configure the activity that is performed in the staging area, that is, define whether it is inbound or outbound or both. Also, it is possible to assign a loading rule.

In such a storage section, you can have one or several bins that are also called staging bays for this kind of storage type.

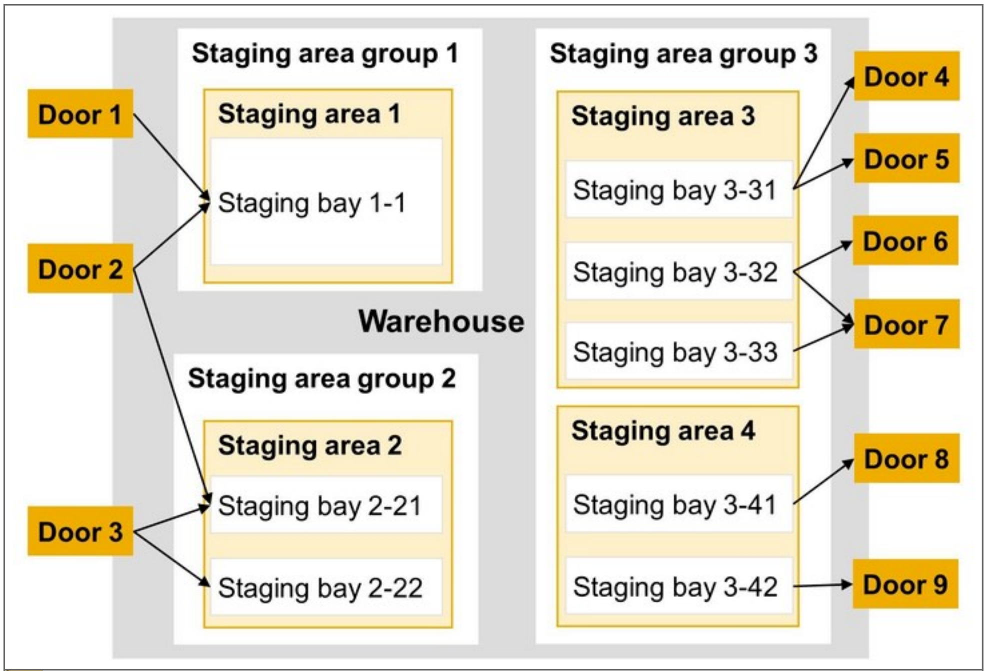


Figure 14: Staging Areas

Graphical Warehouse Layout

The graphical warehouse layout shows a two-dimensional view of the inside of the warehouse. This includes the stock situation and information regarding storage bins, resources, and automatic storage retrieval.

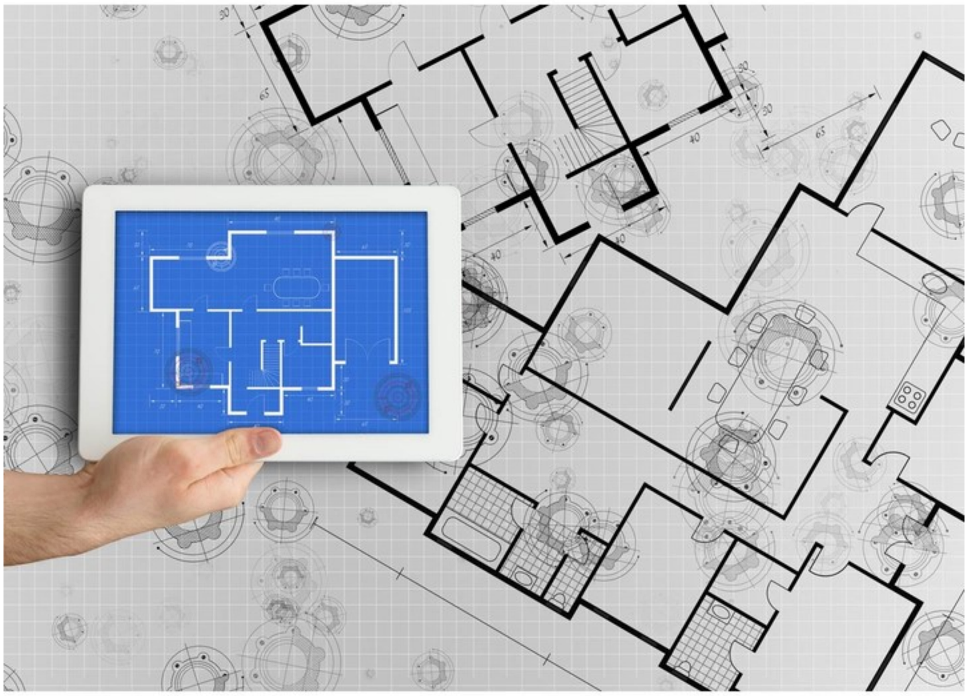


Figure 15: Graphical Warehouse Layout

The dimensions of the storage bins are displayed based on Bin Type definition and the X, Y, and Z coordinates.

Quants

Stock stored in a storage bin is called a **quant**. A quant represents the quantity of a specific product in a single storage bin, a resource, or a transportation unit.

If a batch-managed material is stored in a single storage bin, then the system counts each batch as a different quant.

During putaway, when you put a product into an empty bin in EWM, the system generates a quant in that storage bin. You can increase the quantity of a quant by adding to the existing stock. When you remove the quantity from storage, the system automatically deletes the quant.

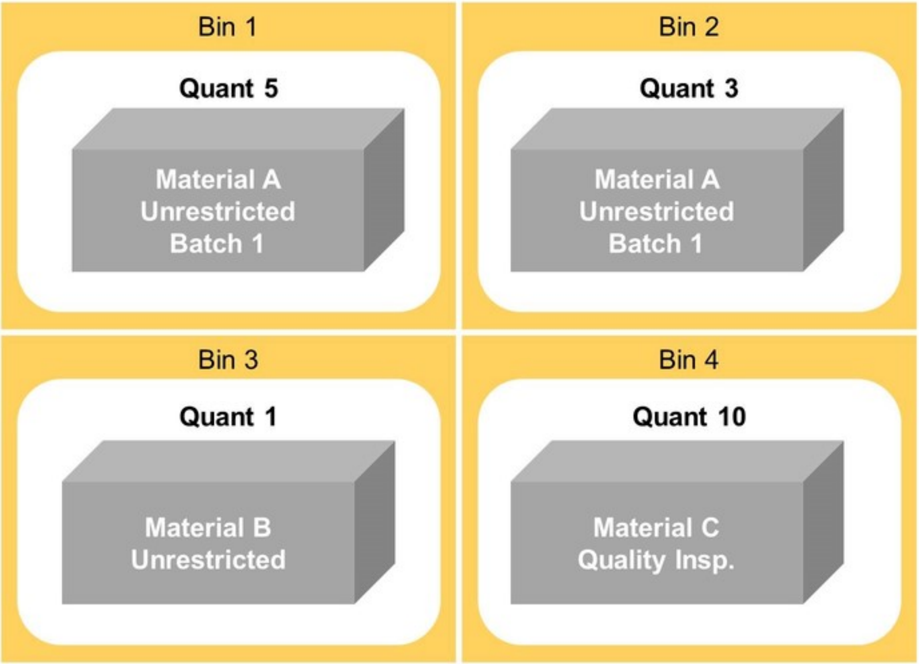


Figure 16: Quant

In the quant record, the system manages the data for the products in a quant. That data includes:

- Quant identification (assigned by the system)
- Product number
- Batch number
- Stock type
- Stock usage

LESSON SUMMARY

You should now be able to:

- Create storage bins
- Display the graphical warehouse layout
- Display a quant

Unit 1
Lesson 3

Maintaining Master Data for SAP EWM

LESSON OVERVIEW

This lesson describes the use of master data in SAP EWM. We look at the transfer of data between SAP ERP and SAP EWM, and you learn how to maintain, transfer, and display master data.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Transfer master data from ERP to SAP EWM
- Maintain warehouse product master data
- Display a packaging specification

Data Transfer Between SAP ERP and SAP EWM

All transaction data, in ERP as well as in SAP EWM, uses master data. Master data, like customer, vendor, material, is data which should only be maintained once and, as much as possible, in one central place.

In general, master data is maintained in the ERP system. In case of an embedded EWM, SAP EWM re-uses this master data and it might only be necessary to enhance the master data with warehouse specific information. In case of a decentral EWM, the master data needs to be distributed from the ERP system to SAP EWM.

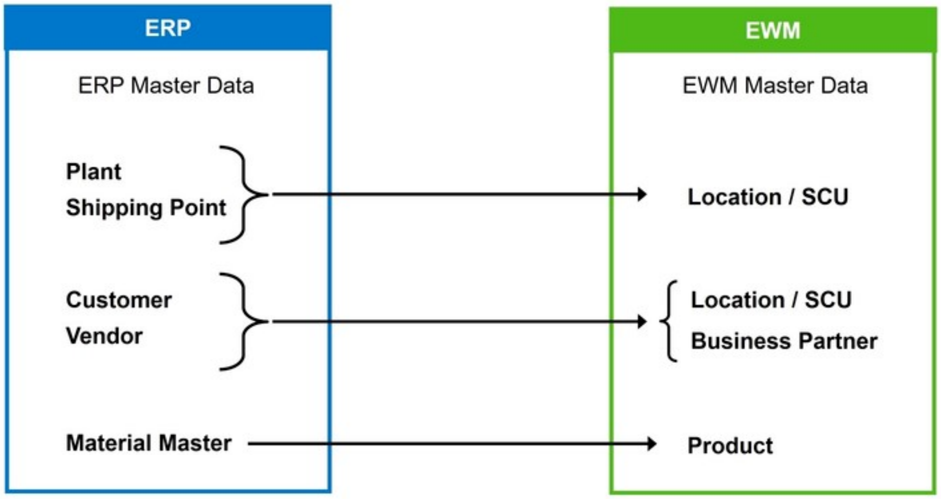


Figure 17: Master Data Distribution

Plant, shipping point, customer master, and vendor master data are used by ERP and by SAP EWM in general. However, master data in the SAP EWM system is not identical to master data in the ERP system. During transfer, the relevant ERP master data is copied to the corresponding SAP EWM **locations** and **business partners Supply Chain Units** are a subset of locations and are required for SAP EWM purposes.

Material master data from an ERP system is transferred to the **Product** master data in an SAP EWM system. The data transferred consists mainly of the following types of information:

- Material descriptions
- Units of measure
- Material product coding fields, for example:
  - Material group
  - Weight specifications
  - Volume specifications

Master Data Transfer Between ERP and Decentral SAP EWM 9.5

Up to SAP EWM 9.5, the distribution of master data from the ERP system was done by using the Core Interface (CIF). CIF has always been used to distribute data to SCM based system and was re-used only for master data for SAP EWM purposes.

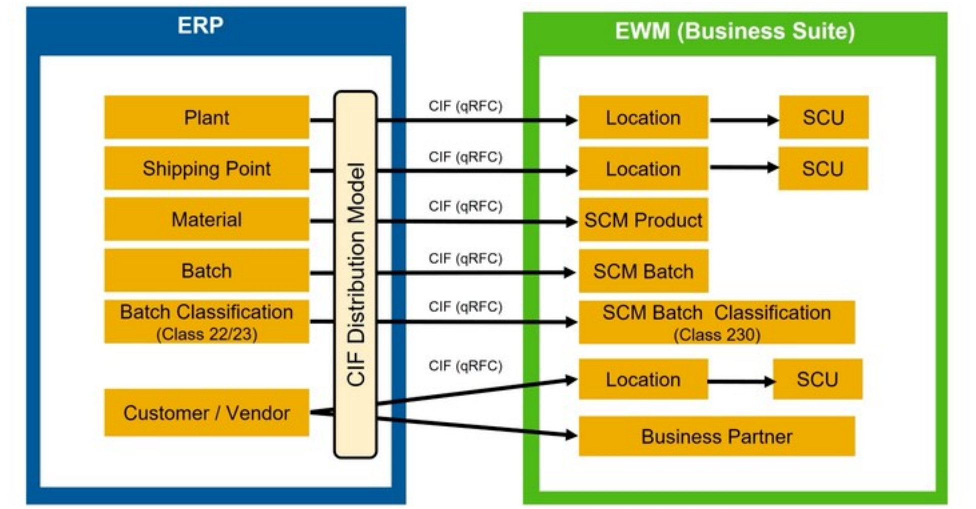


Figure 18: Master Data Distribution up to SAP EWM 9.5

The ERP system in the picture above can be an SAP Business Suite ERP or an SAP S/4HANA system. Supply Chain Units (SCUs) are objects coming from the SCM basis and are used in SAP EWM for structural settings (a warehouse number always has to be connected to a SCU) and for the route determination.

Master Data in SAP S/4HANA with Embedded EWM

In embedded EWM, it is not necessary to distribute master data. SAP EWM simply uses the shared master data from ERP. The SCM product is automatically created in the background, but SCUs have to be created manually.

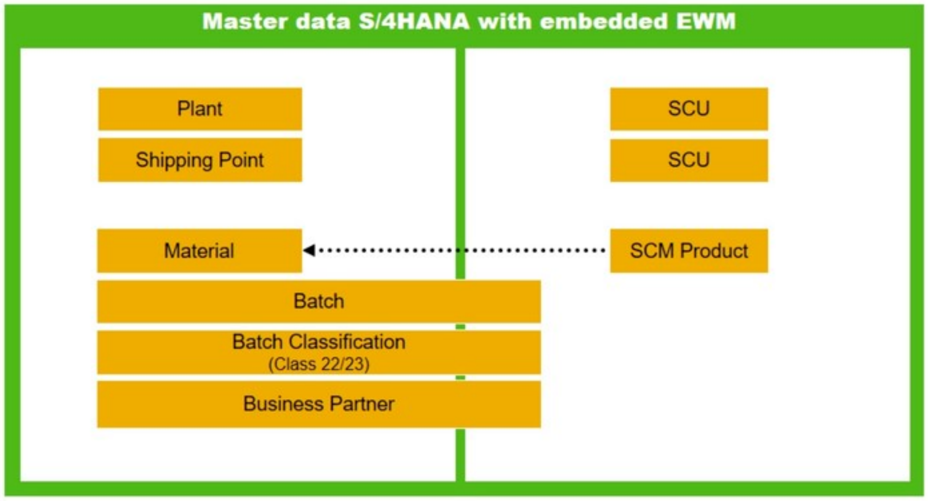


Figure 19: Master Data with SAP S/4HANA Embedded EWM

Locations are not used in embedded EWM.

Master Data Transfer Between ERP and SAP S/4HANA Decentral EWM

If the decentral EWM system is based on SAP S/4HANA, it is not possible to use the Core Interface for master data transfer from ERP. The reason for that is that the EWM part again uses the master data in the ERP part of the decentral system, just like an embedded EWM. And the CIF can not create this master data, it can only create SCM based master data.

Because of this, the master data is transferred via an ALE distribution model using IDOCs.

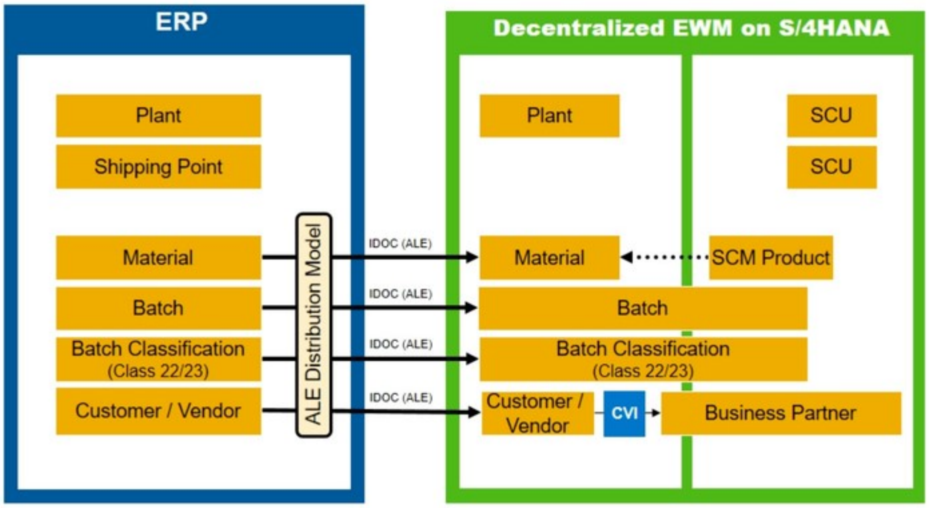


Figure 20: Master Data Distribution with SAP S/4HANA Decentral EWM

The plant and the supply chain units for the warehouse and shipping points have to be created manually in the decentral EWM.

Note:
The SAP note 2840129 - Release information and restrictions of Decentralized EWM on S/4HANA 1909 includes a guide for the ERP / EWM integration which explains the steps for setting up the IDOC communication.

Product Master Data and Warehouse Product Master Data

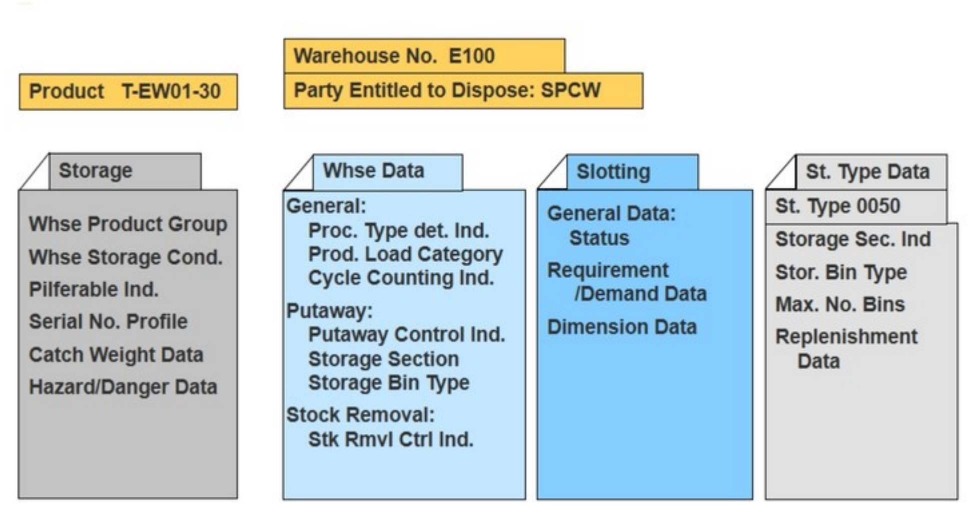


Figure 21: Warehouse Product Master Tabs

Through the transfer of the material master data from ERP to SAP EWM, the product master data is created in the SAP EWM system. Use the “Maintain Product” transaction to access basic product master data. That transaction is available at:

Extended Warehouse Management → *Master Data* → *Product* → *Maintain Data*.

Data in the product master view is global data. It is applicable to all warehouses in which that product is stored.

Product data contains the following information:

- Properties
- Units of measure
- Classification/Item category group/Serial number profile
- Packaging data (in cases where the product is a packaging material)

It is not mandatory, but to add specific warehouse information, you can create a **warehouse product**. This is an extension of the product with information relevant to a specific warehouse and party entitled to dispose. You create and maintain a warehouse product when you want to control processes like putaway or picking product dependent. For certain processes it might be necessary, for example in order to maintain replenishment quantities, to create a warehouse product. There are different possibilities to create, change, or display a warehouse product:

- the transaction */SCWM/MAT1*

  Extended Warehouse Management → *Master Data* → *Product* → *Maintain Warehouse Product*.

> Note:
> Entry of this information is mandatory:
>
> - Warehouse number
> - Party entitled to dispose

- in the *Warehouse Management Monitor*
- with the *Manage Product Master Data* app

While the warehouse product is not created automatically when you transfer materials from ERP to SAP EWM using CIF, there is an option in the warehouse number since SAP EWM 9.2 for this purpose. This option is not available in an SAP S/4HANA embedded EWM, or in an SAP S/4HANA based decentral EWM, because CIF is not used. That means that in this landscape, the warehouse products need to be created separately. Besides the manual creation (in the warehouse product transaction, or in the warehouse management monitor), this can also be done by using the slotting process.

> Note:
> If you are using a SCM based EWM (up to SAP EWM9.5), in the **Product** and in the **Warehouse Product** transactions, you can access fields that are transferred from ERP and should not be changed in SAP EWM. To avoid maintenance of incorrect fields, you can use a *transaction variant*. With a transaction variant, a standard SAP transaction screen can be changed according to your needs. SAP delivers specific transaction variants for these transactions. For details, see SAP note “1451123 - Global product master fields are ready for input in EWM” .
>
> This is not relevant in an SAP S/4HANA based EWM. In such a system, the transactions are already reduced as default.

Warehouse Product Properties

The warehouse product includes all the properties of a product that relate to its storage in a certain warehouse within the framework of SAP Extended Warehouse Management (EWM), for example, the putaway and removal control indicators.

There are three tabs for warehouse specific entries:

Tab	Used to
Warehouse Data	Maintain general data or data that can influence putaway or stock removal.
Slotting	Maintain the parameters that are used in the slotting and rearrangement processes. This information can be determined by the slotting process, but can also be maintained manually.

Storage Type Data	Maintain data that is specific to a particular storage type where a product is stored. This generally consists of indicators used in replenishment and storage bin management.

Packaging Specifications

A packaging specification is another important piece of master data in SAP Extended Warehouse Management. This is used to specify how to pack a product for putaway or for transportation.

A simple example for the use of a packaging specification in the warehouse is for palletization data. Palletization data for a product specifies how that product is packed and putaway.

For example, in your warehouse, you place 50 pieces of Product A on a pallet for putaway. In that case, you:

- Create a packing specification for Product A with:
  - Main packaging material of Pallet
  - Contents of Product A
- Specify a target quantity of 50

If 100 pieces are delivered, the system uses the packing specification to create two warehouse tasks for 50 pieces each, that is 2 pallets of Product A.

Packing Specification Document

The packing specification document defines the necessary packing levels for a product and the related packaging materials. The packing specification includes the steps that must be performed during the packing process.

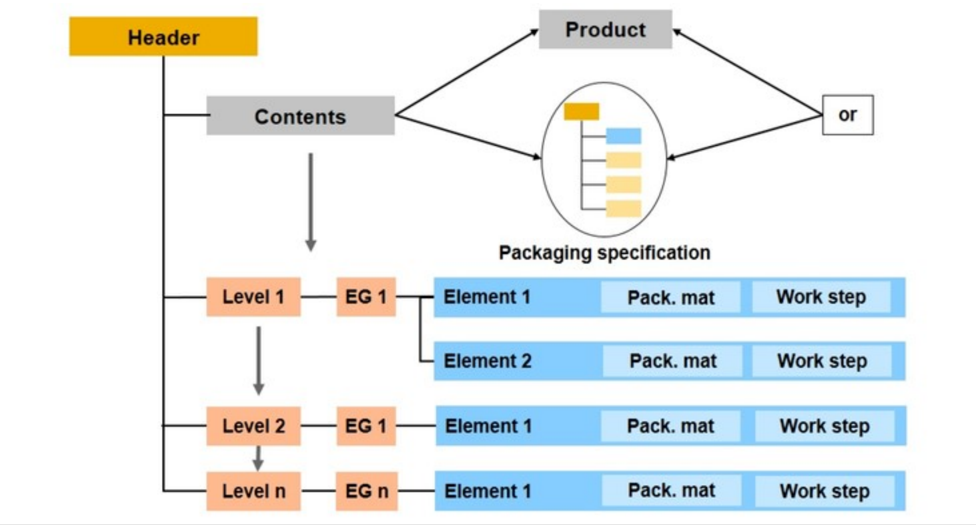


Figure 22: Packaging Specification Structure

A packaging specification has a predefined structure as outlined in the following table:

Structure	Contains
Header	The name of the packaging specification, the user who created it, and its status.
Contents	The name of the product to be packed or the number of another packaging specification.
Level	The level associated with the packaging specification. (A packaging specification can have one or more levels).
Element Group	The element group associated with the packaging specification. (A packaging specification can have one or more element groups. An element group can have one or more elements. Element groups can be re-used.)
Element	A packaging material and/or a work step.

A packaging material is a product that is used to pack products upon, or to pack products in. Packaging materials must be defined as products, using fields that define the characteristics of the packaging such as:

- Maximum packing weight
- Maximum volume

A work step is defined separately and is assigned to a packaging specification element. It is an instruction for a warehouse worker on how to apply a specific step of a packaging specification.

Packaging Specification Determination and the Condition Technique

Packaging specifications are stored using the Integrated Product and Process Engineering (iPPE) database engine. To determine if a packaging specification is to be applied, the **condition technique**is used.

Packaging specification determination is used in following processes:

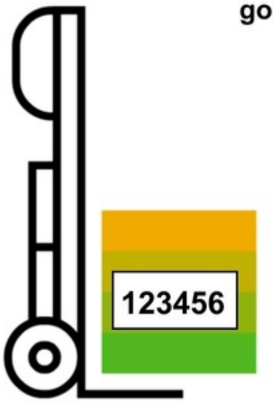
- During automatic packing in goods receipt processing (inbound delivery)
- Determining packaging material in warehouse order creation
- Determining packaging material in delivery processing (goods issue)
- Determining packaging material during consolidation
- Slotting
- During other internal warehouse processes, for example, palletization, determining unit of measure, and so on.

Handling Units

In certain product movement processes, a handling unit is required. A handling unit has a unique identification number that provides the details of that handling unit.

Note:
The unique number for a handling unit number can be created from an internal number range or according to the industry standard EAN128, Serial Shipping Container Coding (SSCC-18).

All information that is relevant to a packed product (for example, batch numbers) are available in the handling unit.



A Handling Unit is a physical collection of goods consisting of….

- **Packaging materials**
  (e.g. Pallet, Carton, Shrink wrap, Container)
- **Products**
  (which have to be transported, stored, used etc..)

Figure 23: Handling Unit

Handling Units Management

In SAP EWM, whether products need to be processed in handling units or not, depends on a number of factors.

If the use of handling units is an enterprise-standard, then products are normally received, warehouse managed, and issued in handling units.

In warehouses where products are not generally managed in handling unit form, certain SAP EWM processes require that products (received or issued) are packed into handling units. This may be only temporarily, for example, to facilitate the internal SAP EWM processes. In those cases, the putaway process in SAP EWM requires that the item is packed in an handling unit (HU). Once the physical storage of that item is complete, the HU number can be removed from the item (on the system).

Handling units can only be stored in storage bins within a storage type that has been configured to allow handling units. In SAP EWM customizing of Storage Types, you indicate whether putaway with HUs is mandatory in the storage type or if HUs are allowed or forbidden.

Handling units are created internally by SAP EWM to represent vehicles and their load in:

- Yard Management
- Transportation Cross Docking

- Other transportation functions

LESSON SUMMARY

You should now be able to:

- Transfer master data from ERP to SAP EWM
- Maintain warehouse product master data
- Display a packaging specification

Unit 1

Learning Assessment

1. From the following list, identify the value-added service.

   Choose the correct answer.

   ☐ A Warehouse structure
   ☐ B Packaging
   ☐ C Warehouse Management
   ☐ D Cross-Docking

2. Which of these functions are available in Warehouse Management?

   Choose the correct answers.

   ☐ A Managing inventory at the storage bin level
   ☐ B Processing sales orders
   ☐ C Purchasing goods
   ☐ D Processing goods movements

3. Which SAP system do you use when you create a Purchase Order?

   Choose the correct answer.

   ☐ A SAP ERP
   ☐ B SAP EWM
   ☐ C SAP Decentralized WM

4. Identify the primary function from the following list of warehouse management functions:

   Choose the correct answer.

   ☐ A Slotting
   ☐ B VAS
   ☐ C Inventory management at storage bin level
   ☐ D Labor management

5. A storage bin is the smallest unit of space in a warehouse.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

6. Which of these tasks are performed in warehouse Activity Areas?

   Choose the correct answers.

   ☐ A Putaway

   ☐ B Picking

   ☐ C Physical Inventory

7. In which sequence can you usually find the following elements in a bin coordinate or bin name?

   Arrange these steps into the correct sequence.

   ☐ Aisle

   ☐ Stack

   ☐ Level

8. Stock stored in a storage bin is called a quant.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

9. Master data in the SAP EWM system is identical to master data in the ERP system.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

10. Product Master Data includes which of the following pieces of information:

Choose the correct answers.

☐ A Product properties

☐ B Product stock levels

☐ C Product unit of measure

☐ D Product classification

11. What are packing specifications used for?

Choose the correct answers.

☐ A For palletization

☐ B For pick HUs

☐ C For unloading

Unit 1

Learning Assessment - Answers

1. From the following list, identify the value-added service.

   Choose the correct answer.

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   ☒ B Packaging

   ☐ C Warehouse Management

   ☐ D Cross-Docking

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   Correct. A storage bin is the smallest unit of space in a warehouse.

6. Which of these tasks are performed in warehouse Activity Areas?

   Choose the correct answers.

   ☒ A Putaway

   ☒ B Picking

   ☒ C Physical Inventory

   Correct. All of these tasks are performed in activity areas.

7. In which sequence can you usually find the following elements in a bin coordinate or bin name?

   Arrange these steps into the correct sequence.

   1 Aisle

   2 Stack

   3 Level

8. Stock stored in a storage bin is called a quant.

   Determine whether this statement is true or false.

   ☒ True

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UNIT 2

Basic Processes in SAP EWM

Lesson 1

Processing Goods Received 39

Lesson 2

Processing Goods for Shipping 48

UNIT OBJECTIVES

- Execute the inbound process
- Display goods receipts in SAP ERP
- Create warehouse tasks and warehouse orders for putaway
- Execute the outbound process
- Create a warehouse task for picking
- Post the goods issue

UNIT 2

Basic Processes in SAP EWM

Lesson 1

Processing Goods Received 39

Lesson 2

Processing Goods for Shipping 48

UNIT OBJECTIVES

- Execute the inbound process
- Display goods receipts in SAP ERP
- Create warehouse tasks and warehouse orders for putaway
- Execute the outbound process
- Create a warehouse task for picking
- Post the goods issue

Unit 2
Lesson 1

Processing Goods Received

LESSON OVERVIEW

This lesson describes the goods received process and the documents involved. You learn how to execute the inbound process, create warehouse tasks and orders for putaway, and display goods receipts.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Execute the inbound process
- Display goods receipts in SAP ERP
- Create warehouse tasks and warehouse orders for putaway

Purchase Order and Inbound Delivery in ERP

The process starts in the ERP system with a purchase order. A purchase order can be created based on a purchase requisition, but it is also possible to create the purchase order directly, without reference to another document.

In the purchase order, you order a quantity of a material for your plant and storage location.

For processing the goods receipt of the material in a decentral warehouse management system, you require an inbound delivery. This can be created manually when the goods arrive at your warehouse. The process which allows better planning is by receiving an Advanced Shipping Notification (ASN) document from your vendor. This is usually sent using EDI (Electronic Data Interchange). When the ASN arrives, the system generates an inbound delivery document.

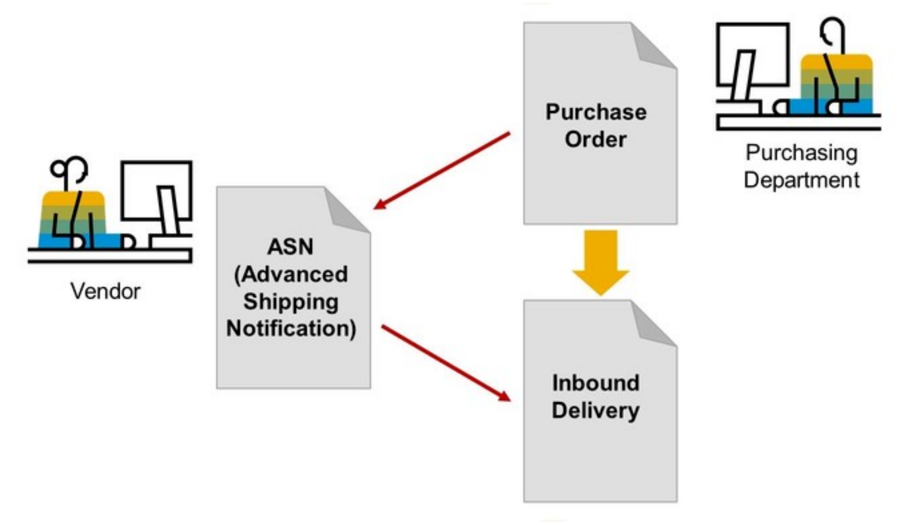

Figure 24: Purchase Order And Inbound Delivery

> Note:
> If you do not use EDI, it is possible to create the inbound delivery manually.

Confirmation Control Key

When you create the purchase order, you must define whether you expect a shipping notification from your supplier or not. Define this using a confirmation control key (in our training system this is “ANLI”) which is set at each purchase item level. You can pre-define the control key either in shipping customizing, the information record, or in vendor master data.

If the confirmation control key is set, an **inbound delivery**document must be created. The inbound delivery is based on the purchase order. If the confirmation control key is set but the inbound delivery not yet created, it is not possible to post a goods receipt.

The inbound delivery contains information from the purchase order, including the:

- Material to arrive
- Quantity of that material to arrive
- Plant and storage location

Inbound Delivery Notification and Inbound Delivery

The ERP inbound delivery is copied into the SAP EWM Inbound Delivery Notification. It contains the same information and it has the same basic structure as the inbound delivery in the ERP system. The next document, the Inbound Delivery, is created automatically by the Post Processing Framework (PPF). The PPF is the follow-up model of ERP's output control. PPF provides tools to plan, start, and monitor actions such as printing and sending emails and faxes, starting workflows, or starting BAdIs (Business Add-Ins).

- In SAP EWM, the ERP inbound delivery is stored as an Inbound Delivery Notification. In embedded EWM this inbound delivery notification does not exist, in a decentral EWM from

SAP EWM 9.5 on, you can choose to skip the inbound delivery notification. In these cases the inbound delivery is created directly.

- The Inbound Delivery document number is generated with an SAP EWM-specific number range. In embedded EWM or in a decentral EWM based on SAP S/4HANA, it is possible to re-use the ERP delivery number for the SAP EWM inbound delivery. While this is practical for embedded EWM, this might create issues if your decentral EWM is connect to more then one ERP backend (and the number ranges in these systems overlap).
- Any changes to the Inbound Delivery document are sent back to ERP. An Inbound Delivery document with status of **Execution completed**is the basis for a Proof of Delivery document in ERP.
- The Inbound Delivery Notification and Inbound Delivery documents are for a single warehouse. The Inbound Delivery document can also be used for forecasting the WM capacity load. SAP EWM processing is done from the Inbound Delivery document.
- The Inbound Delivery document is also called a Warehouse Request and all subsequent actions in the warehouse are based on that document.

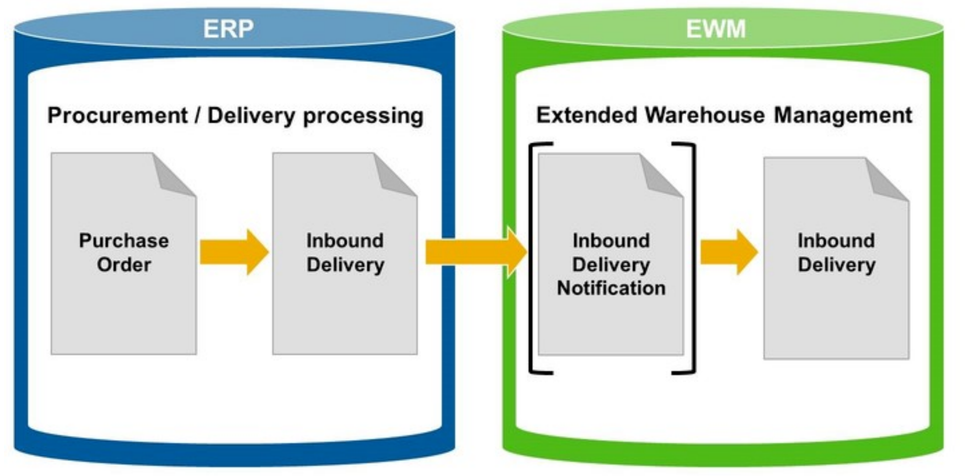
ERP
Procurement / Delivery processing
Purchase Order
Inbound Delivery
EWM
Extended Warehouse Management
Inbound Delivery Notification
Inbound Delivery

Figure 25: Goods Receipt Inbound Deliveries Process Flow

Warehouse Request

Warehouse Activities

A warehouse request enables the processing of warehouse activities. Warehouse activities are:

- Picking
- Putaway
- Posting changes
- Stock transfers (within warehouse)
- Scrapping

These are performed using warehouse tasks and these documents are created with reference to the respective Warehouse Request. Using the Warehouse Management Monitor, you can display and supervise all documents that are based on a Warehouse Request.

When a Warehouse Request is created, the delivery data from ERP is mapped, SAP EWM-specific data is determined, and a Warehouse Process Type is assigned. The Warehouse Process Type controls the processing of a warehouse task in SAP EWM.

When the warehouse request (inbound or outbound) is created or changed, the system automatically adds data. If a packaging specification exists, SAP EWM can automatically create handling units for inbound deliveries. You can determine packaging specifications using the condition technique.

During the creation of an inbound delivery with a corresponding handling unit, there is a check to determine if the handling unit is permitted in the warehouse. If a product is batch-managed, batches can be created.

Handling Unit Integration

In the ERP Inbound Delivery, you can create a handling unit (HU) manually in the packing transaction or your supplier tells you the packaging data in the shipping notification. The HU number is transferred to SAP EWM and is visible in the *HU* tab in the inbound delivery notification and in the inbound delivery.

You can putaway this HU. Customizing of the destination storage type defines whether you can or must settle packed or unpacked products.

Note:
ERP Handling Unit Management cannot be assigned. However, the HU is visible in the ERP Handling Unit Monitor and it is assigned to the inbound delivery.

Goods Receipt

Goods receipt posting is triggered from the SAP EWM system to the ERP system. In the ERP system, the inventory management document, together with the required financial document, must be created.

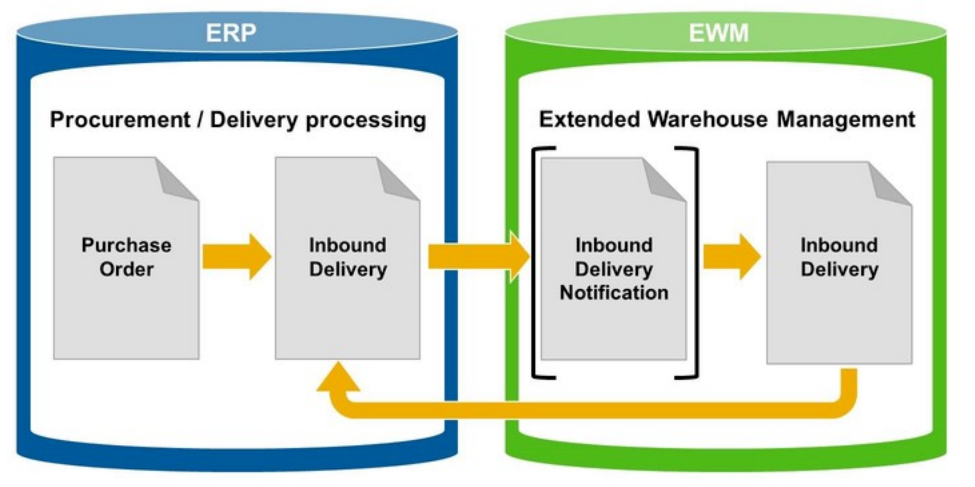
ERP
EWM
Procurement / Delivery processing
Extended Warehouse Management
Purchase Order
Inbound Delivery
Inbound Delivery Notification
Inbound Delivery

Figure 26: Goods Receipt Posting

The goods receipt posting can be the first step when processing an inbound delivery or it can be done automatically when confirming the warehouse task for putaway. Additionally, there is a separate transaction to post the physical goods receipt. That transaction is ideal for use at a warehouse door. Various objects are available for posting the goods receipt, for example:

- Transportation unit
- Handling unit
- Product number
- Deliveries

Goods Receipt Posting

In the delivery document, the system copies the receiving plant and the storage location from the PO. The system checks if this combination of plant and storage location is assigned to a warehouse. If the combination is assigned to a warehouse number, the system checks if the assigned warehouse number is an SAP EWM warehouse. If so, the system replicates the inbound delivery to SAP EWM as an inbound delivery notification.

The goods receipt posting can only be performed if the goods have physically arrived. In SAP EWM, it is possible to map this stock with two storage locations. While the stock is in the putaway process, it is kept in one particular storage location (and in the training class, we use storage location **RD00, received on dock**). Goods that are finally settled in a destination bin, are kept in another storage location (and in the training class, we use storage location **AF00, available for sale**). By doing that, ERP inventory management can display the stock, but makes it transparent for the user that this stock is in the process of putaway and it is not fully available. This is a standard scenario.

Other inbound delivery scenarios are supported such as:

- Returns from the customer
- Goods from production
- Goods received from expected goods receipt processing

Warehouse Task

Warehouse tasks are used to execute good movements in the warehouse, and these movements may be physical or just stock changes.

Warehouse tasks are needed for:

- Picking
- Putaway
- Internal movements
- Posting changes
- Goods receipt postings
- Goods issue postings

The warehouse task is a document that tells the warehouse worker what to do, for example, move x pallets of product y to storage bin abc.

In a putaway or picking process, or for posting changes, the base for the warehouse task is the warehouse request.

For each warehouse request item, the warehouse task is created either manually or automatically by the Post Processing Framework (PPF).

In cases where warehouse stock must be transferred from one bin to another, it is possible to create a warehouse task without any reference document.

When the warehouse task is executed, the warehouse task must be confirmed. During confirmation, the warehouse worker confirms that the correct quantity of the correct product arrived at the correct destination bin.

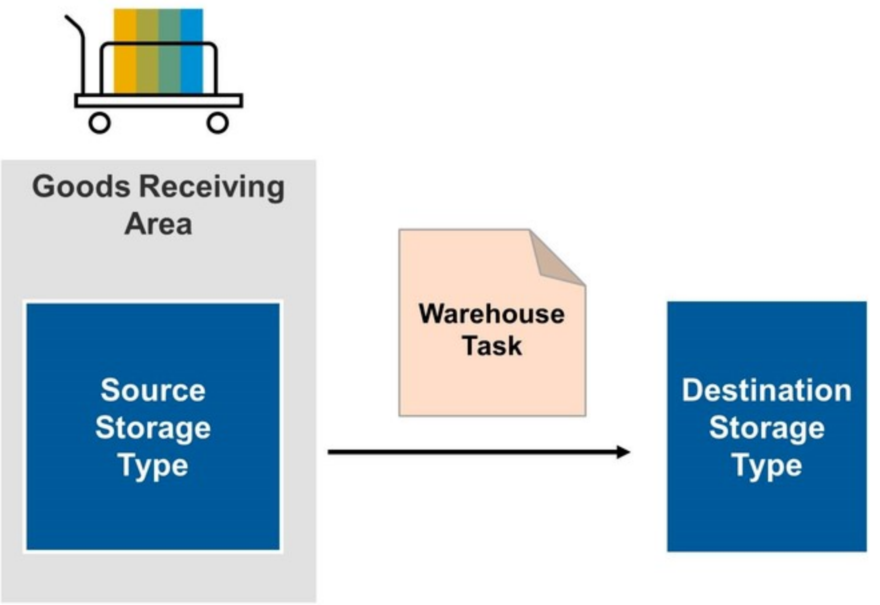

Figure 27: Movements through Warehouse Tasks

Note:
If the warehouse worker finds that the planned quantity (target quantity) does not match the quantity that arrived, the worker confirms the task with a difference quantity. In this case, the worker must enter a predefined exception code and depending the reason for the exception, the quantity in the delivery can be reduced or the difference is posted as a loss.

Warehouse Task Creation for Putaway

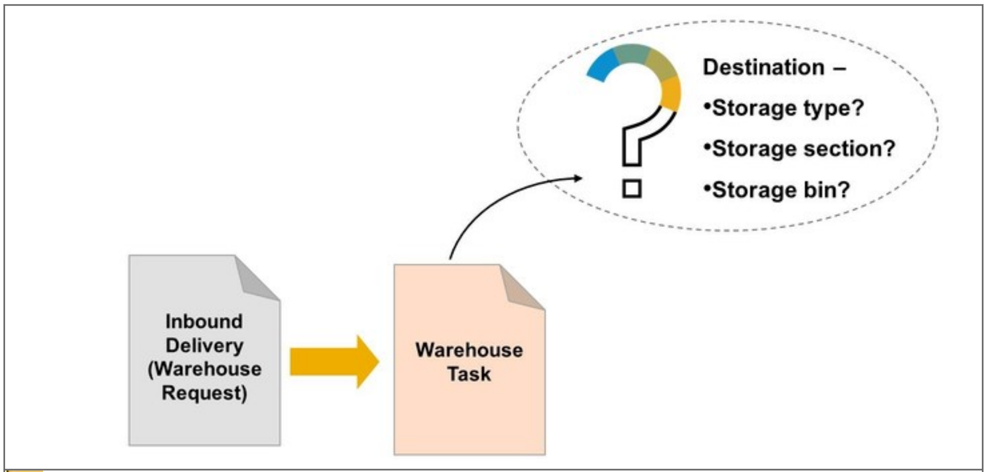

Figure 28: Warehouse Task Creation for Putaway

If a product is transferred from a source bin to a destination bin in the warehouse, this may be performed in a single step. The associated document is the Product Warehouse Task. It contains the required information, for example, the Warehouse Process Type (WPT) to use, the source bin, and the destination bin. That is a simple case. The situation can be more complex, for example, it may be necessary to repack the goods in a packaging work station before moving the goods to the destination bin. This is done with an HU warehouse task. The HU warehouse task contains the same information as the product warehouse task, but it is used for packed products and when movements are done with several process steps.

Warehouse Order

Warehouse tasks are grouped (or bundled) in a warehouse order. The warehouse order represents an executable work package that a warehouse employee should complete within a specific time frame. It contains one or more warehouse tasks or physical inventory items.

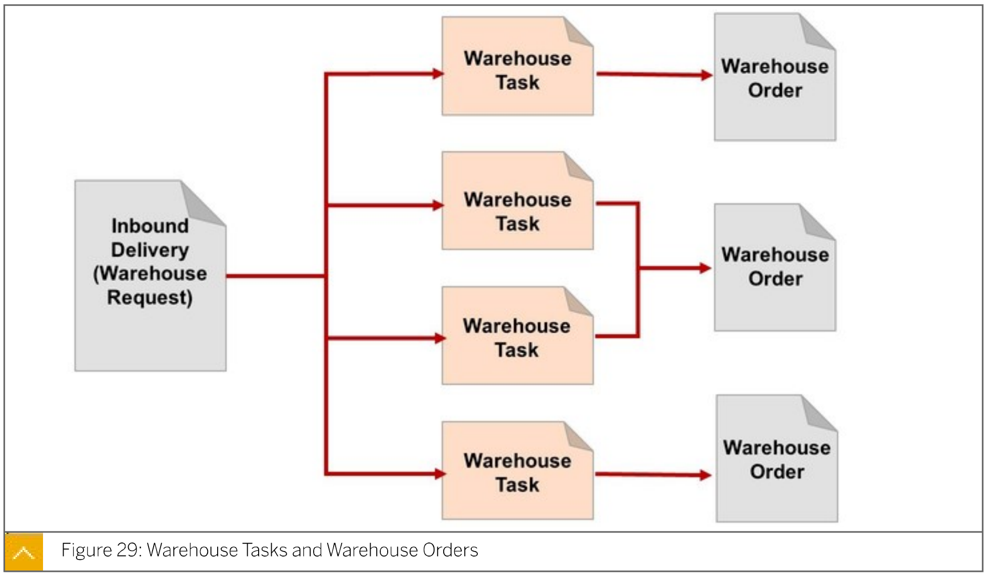

Figure 29: Warehouse Tasks and Warehouse Orders

Warehouse Task Creation for Putaway

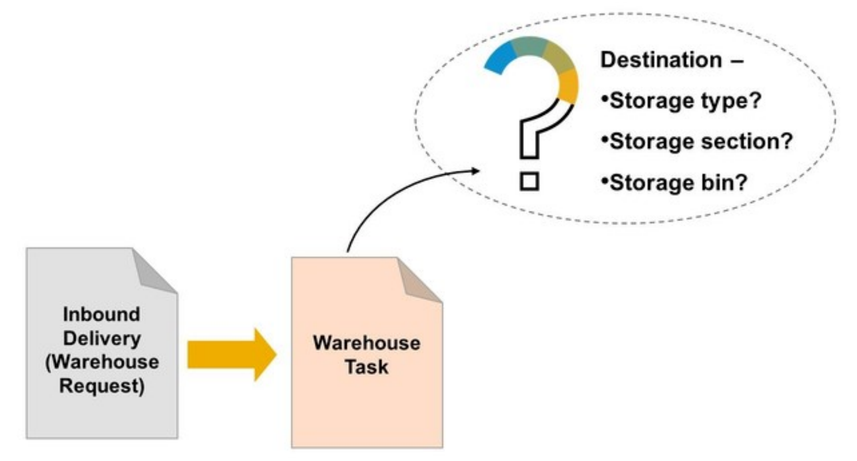

Figure 28: Warehouse Task Creation for Putaway

If a product is transferred from a source bin to a destination bin in the warehouse, this may be performed in a single step. The associated document is the Product Warehouse Task. It contains the required information, for example, the Warehouse Process Type (WPT) to use, the source bin, and the destination bin. That is a simple case. The situation can be more complex, for example, it may be necessary to repack the goods in a packaging work station before moving the goods to the destination bin. This is done with an HU warehouse task. The HU warehouse task contains the same information as the product warehouse task, but it is used for packed products and when movements are done with several process steps.

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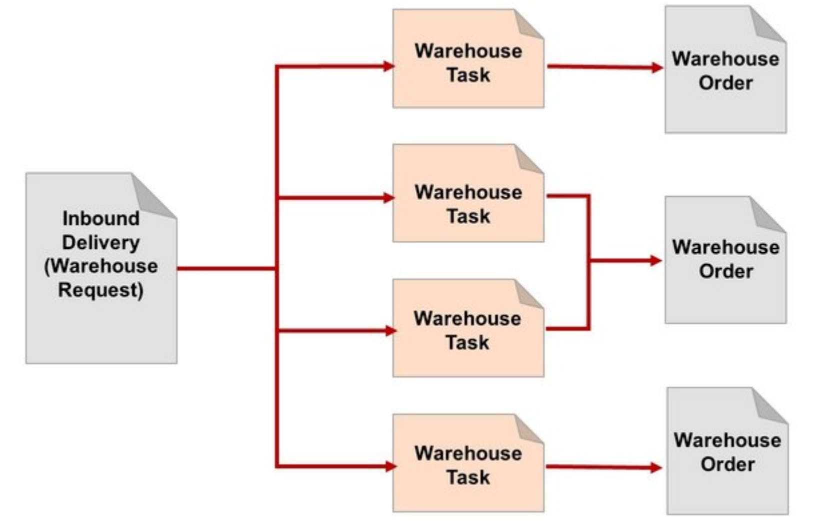


Figure 29: Warehouse Tasks and Warehouse Orders

Warehouse tasks are created when products are received, issued, moved, or counted. Multiple warehouse tasks can be grouped together into warehouse orders and SAP EWM makes them available for processing. For example, in the goods receipt process, warehouse tasks are created to move the products into the warehouse and to their destination storage bins. SAP EWM groups these tasks together, according to warehouse order creation rules, to form warehouse orders.

> Note:
> The Warehouse Order Creation Rules (WOCRs) are defined in Customizing.

Warehouse Order Creation Rules

Warehouse orders are created as follows:

1. Warehouse tasks are grouped together according to the activity area in which they are sorted, using predefined rules.
2. For each activity area, one or more warehouse order creation rules are defined.
3. The warehouse order creation rules are applied until each warehouse task is assigned to one warehouse order. Filters and limits are used as necessary.
4. If rules cannot be used, an SAP-supplied standard rule is applied.

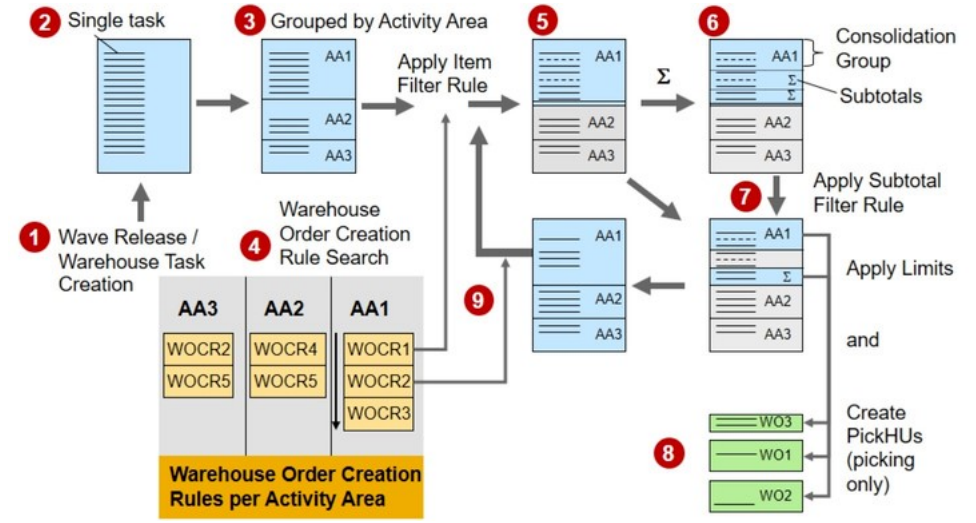

2 Single task
3 Grouped by Activity Area
5
6
AA1
AA2
AA3
Apply Item Filter Rule
Σ
Consolidation Group
Subtotals
Apply Subtotal Filter Rule
7
1 Wave Release / Warehouse Task Creation
4 Warehouse Order Creation Rule Search
9
Apply Limits
and
Create PickHUs (picking only)
AA3
AA2
AA1
WOCR2
WOCR5
WOCR4
WOCR5
WOCR1
WOCR2
WOCR3
Warehouse Order Creation Rules per Activity Area
8
WO3
WO1
WO2

Figure 30: Warehouse Order Creation

Search Sequence for Order Creation

During the grouping of warehouse tasks into warehouse orders, SAP EWM uses the search sequence for warehouse order creation, for example, rule A, then rule B, then rule C. SAP EWM works through the warehouse order creation rules in sequence, as defined for each activity area.

- Filters and limit values: Control which warehouse tasks, and how many warehouse tasks, SAP EWM groups into a warehouse order.

- Sort rules: When SAP EWM applies a warehouse order creation rule, it sorts the warehouse tasks according to the sort rule. Individual warehouse order creation rules can contain sort rules.

In addition to sort rules and filter and limit values, warehouse order creation rules can also contain parameters for packing and consolidation groups.

- Consolidation groups: During warehouse order creation, consolidation groups determine warehouse tasks that are permitted to be bundled together.

As warehouse orders are based on the complete summarization of warehouse tasks, when all configured warehouse order creation rules have been applied, every warehouse task should be assigned to a warehouse order. No warehouse tasks should remain. If SAP EWM has applied all user-defined warehouse order creation rules for the search sequence, and unprocessed warehouse tasks still remain, the system uses a remainder rule.

- Remainder rules: Create warehouse orders for any remaining warehouse tasks. SAP EWM summarizes these warehouse tasks per activity area, queue, and consolidation group.
- Standard rules: Group tasks per activity area, queue and delivery. If the system cannot find a warehouse order creation rule for an activity area, SAP EWM applies this rule.

LESSON SUMMARY

You should now be able to:

- Execute the inbound process
- Display goods receipts in SAP ERP
- Create warehouse tasks and warehouse orders for putaway

Unit 2
Lesson 2

Processing Goods for Shipping

LESSON OVERVIEW

This lesson describes the goods shipping process and the documents involved. You learn how to execute the outbound process, create a warehouse task for picking, and post goods issues.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Execute the outbound process
- Create a warehouse task for picking
- Post the goods issue

Sales Order and Outbound Delivery

The sales order process can contain various single activities, for example:

- Presales
- Order processing
- Availability check
- Picking
- Packing and shipping
- Billing and payment

Sales Documents

Every sales activity has an associated sales document. (All business transactions are mapped with specially-configured document types.) The assigned status shows the stage in the sales process that a sales order has reached.

Sales and distribution are integrated with other application components in ERP such as Production (Material Requirement Planning, Manufacturing), Material Management, and Financial Accounting and Controlling.

Also, sales and distribution processing interfaces with other SAP Business Suite solutions such as Customer Relationship Management (CRM) and Supply Chain Management (SCM). This is achieved using the applications Advanced Planner and Optimizer (APO) and Extended Warehouse Management (EWM).

Some functions in SAP EWM require sales orders that have been created in the SAP-CRM solution.

To document and control activities, various documents map the individual steps.

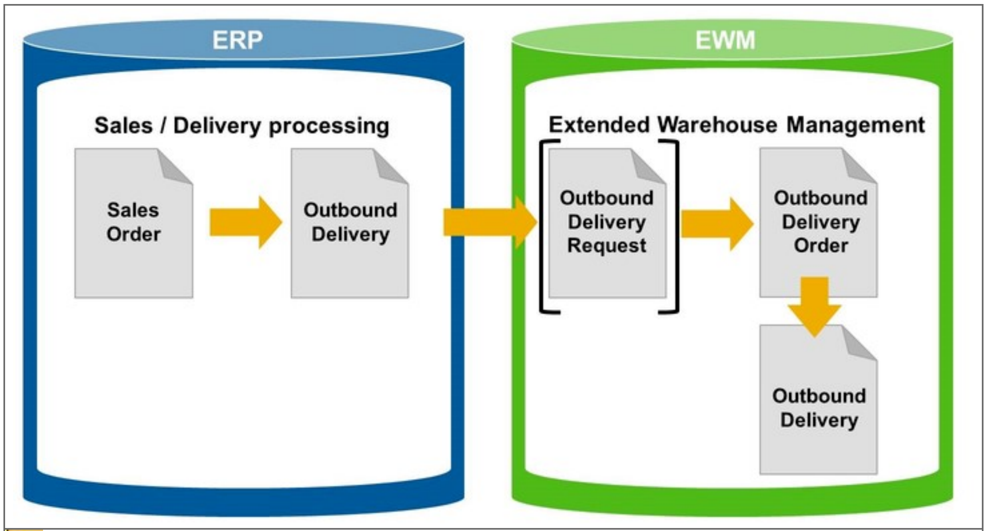

ERP
Sales / Delivery processing
Sales Order
Outbound Delivery
EWM
Extended Warehouse Management
Outbound Delivery Request
Outbound Delivery Order
Outbound Delivery

Figure 31: Goods Issue Outbound Deliveries Process Flow

Documents Created During Sales Order Processing

The sold-to-party orders a product and the sales division creates a sales order in SAP CRM or SAP ERP. After processing, an outbound delivery is created. If that outbound delivery is relevant for picking in an EWM managed warehouse, it is forwarded to SAP EWM.

For the outbound delivery coming from ERP, an **Outbound Delivery Request** is created in SAP EWM. This interim document triggers a Post Processing Framework (PPF) action that creates the next document, the **Outbound Delivery Order**. At the end of the process, an additional document is created in SAP EWM, the **Outbound Delivery**. Details for this are explained in a later section.

In SAP S/4HANA embedded EWM, the outbound delivery request does not exist and the outbound delivery order is created directly. In a decentral EWM, from SAP EWM 9.5 and later, you can decide to have no outbound delivery request and the outbound delivery order created directly from the ERP document.

Along with managing sales order documents, the outbound business process also deals with stock transport orders. In that process, one plant in an enterprise requests material from another plant within the same corporate enterprise. That starts a long-distance physical stock transfer.

Warehouse Request

The outbound delivery order is the warehouse request for the goods issue processes. It defines the work list for SAP EWM and is the basis for the execution of picking activities. The warehouse request is used to create warehouse tasks. An outbound delivery order contains all the data that is required for triggering and monitoring the complete outbound delivery process. The process starts with the first planning activities for the outbound delivery order and continues until the finished goods have been loaded and sent. Use the outbound delivery order to do one of the following:

- Preview the planning of pending warehouse activities
- Execute the actions required to create a delivery

When the outbound delivery order is created and saved, the following steps are executed:

- Mapping of delivery data from ERP onto the SAP EWM delivery data
- Data enrichment using data from SAP EWM customizing
- Wave assignment (depending on customizing)
- Determination of a warehouse process type (which controls warehouse task processing in SAP EWM)

It is also possible to perform the following actions:

- Determine the source storage bin, the staging area, the door assignment, and the route
- Add a packing item

Warehouse Task

Warehouse tasks are used to execute good movements in the warehouse, and these movements may be physical or just stock changes.

Warehouse tasks are needed for:

- Picking
- Putaway
- Internal movements
- Posting changes
- Goods receipt postings
- Goods issue postings

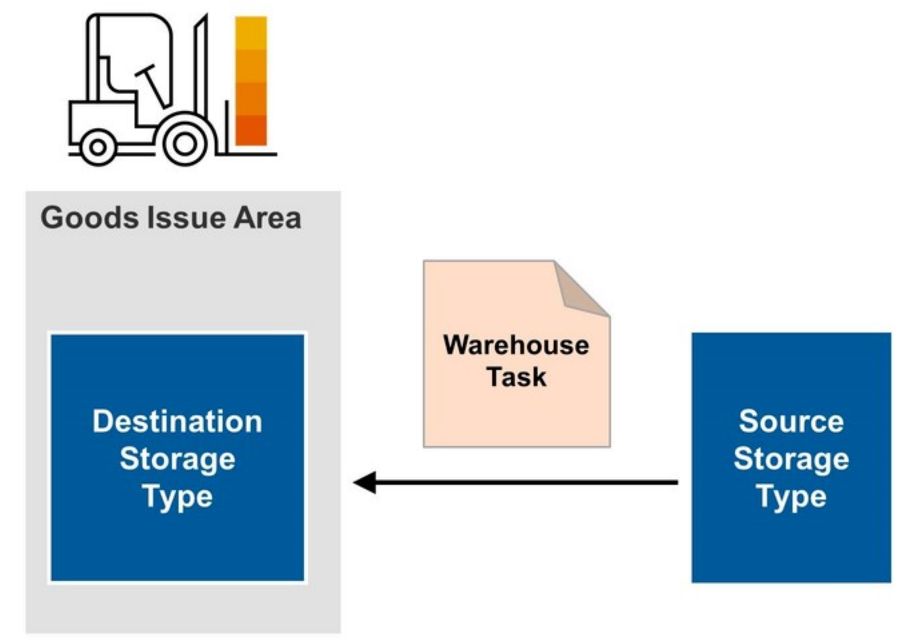


Figure 32: Movements through Warehouse Tasks

The warehouse task is a document that tells the warehouse worker what to do, for example, move x pallets of product y to storage bin abc.

In a putaway or picking process or for posting changes, the base for the warehouse task is the warehouse request.

For each warehouse request item, the warehouse task is created either manually or automatically by the Post Processing Framework (PPF).

In cases where warehouse stock must be transferred from one bin to another, it is possible to create a warehouse task without any reference document.

When the warehouse task is executed, the warehouse task must be confirmed. During confirmation, the warehouse worker confirms that the correct quantity of the correct product arrived at the correct destination bin.

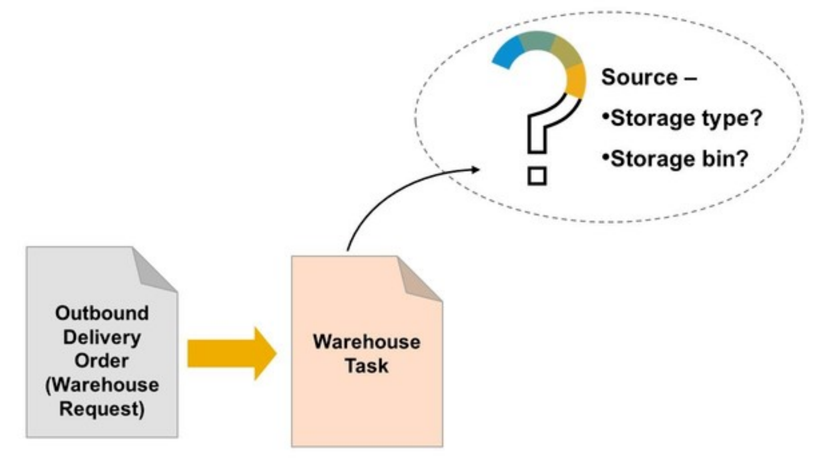


Figure 33: Warehouse Task Creation for Picking

If a product is transferred from a source bin to a destination bin in the warehouse, this may be performed in a single step. The associated document is the Product Warehouse Task. It contains the required information, for example the Warehouse Process Type (WPT) to use, the source bin, and the destination bin. That is a simple case. The situation can be more complex, for example, it may be necessary to pack the goods in a pick handling unit (HU) before moving the goods to the destination bin. In this case a combination of product and HU warehouse tasks are used. The HU warehouse task contains the same information as the product warehouse task, but it is used for packed products when movements are done with several process steps.

Warehouse Order

Warehouse tasks are grouped (or bundled) in a warehouse order. The warehouse order represents an executable work package that a warehouse employee should complete within a specific time frame. It contains one or more warehouse tasks or physical inventory items.

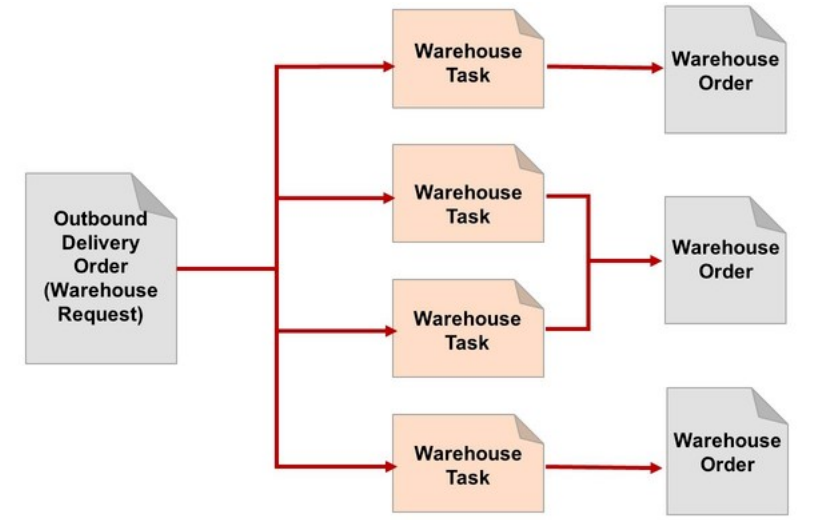


Figure 34: Warehouse Tasks and Warehouse Orders

Warehouse tasks are created when products are received, issued, moved, or counted. Multiple warehouse tasks can be grouped together into warehouse orders and SAP EWM makes them available for processing. For example, in the goods receipt process, warehouse tasks are created to move the products into the warehouse and to their destination storage bins. SAP EWM groups these tasks together, according to warehouse order creation rules, to form warehouse orders.

Note:
The Warehouse Order Creation Rules (WOCRs) are defined in Customizing.

Warehouse Order Creation

Warehouse orders are created as follows:

1. Warehouse tasks are grouped together according to the activity area in which they are sorted using predefined rules.
2. For each activity area, one or more warehouse order creation rules are defined.
3. The warehouse order creation rules are applied until each warehouse task is assigned to one warehouse order. Filters and limits are used as necessary.
4. If rules cannot be used, an SAP-supplied standard rule is applied.

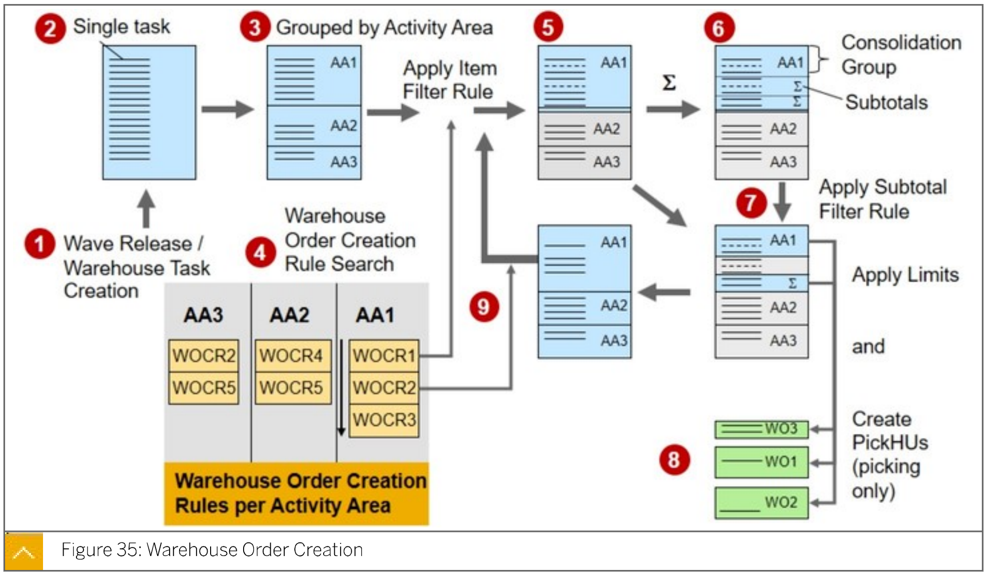

2 Single task
3 Grouped by Activity Area
5
6
AA1
AA2
AA3
Apply Item Filter Rule
Σ
Consolidation Group
Subtotals
Apply Subtotal Filter Rule
7
1 Wave Release / Warehouse Task Creation
4 Warehouse Order Creation Rule Search
9
Apply Limits
and
Create PickHUs (picking only)
WOCR2
WOCR5
WOCR4
WOCR5
WOCR1
WOCR2
WOCR3
WO3
WO1
WO2
8
Warehouse Order Creation Rules per Activity Area

Figure 35: Warehouse Order Creation

Grouping Warehouse Tasks

During the grouping of warehouse tasks into warehouse orders, SAP EWM uses the search sequence for warehouse order creation, for example, rule A, then rule B, then rule C. SAP EWM works through the warehouse order creation rules in sequence, as defined for each activity area.

Filter and Limit Values Control which warehouse tasks, and how many warehouse tasks SAP EWM groups into a warehouse order.

Sort Rules: When SAP EWM applies a warehouse order creation rule, it sorts the warehouse tasks according to the sort rule. Individual warehouse order creation rules can contain sort rules.

In addition to the sort rules and filter and limit values, warehouse order creation rules can also contain parameters for packing and consolidation groups.

Consolidation Groups During warehouse order creation, the consolidation group determines the warehouse tasks that are permitted to be bundled together.

Remainder Rules

As warehouse orders are based on the complete summarization of warehouse tasks, when all configured warehouse order creation rules have been applied, every warehouse task should be assigned to a warehouse order. No warehouse tasks should remain.

If SAP EWM has applied all user-defined warehouse order creation rules for the search sequence, and unprocessed warehouse tasks still remain, the system uses a remainder rule.

Remainder rules create warehouse orders for any remaining warehouse tasks. SAP EWM summarizes these warehouse tasks per activity area, queue, and consolidation group.

If the system cannot find a warehouse order creation rule for an activity area, SAP EWM applies the **standard rule**, which groups tasks per activity area, queue, and delivery.

Goods Issue

Once the materials are picked and are at the goods issue zone, you can post the goods issue.

Unit 2

Learning Assessment

1. An Advanced Shipping Notification is based on a Purchase Order.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

2. Which one of the following objects is required for posting the goods receipt in SAP EWM?

   Choose the correct answer.

   ☐ A Purchase Order

   ☐ B Warehouse Task

   ☐ C Inbound Delivery

   ☐ D Store Location

3. The warehouse order contains one or more warehouse tasks or physical inventory items.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

4. A sales order usually comes from:

   Choose the correct answers.

   ☐ A CRM

   ☐ B ERP

   ☐ C SCM

5. Filters and limit values controls which products can be grouped together in the goods-issue zone.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

6. An SAP EWM outbound delivery sends information about the goods issue posting back to ERP.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

Unit 2

Learning Assessment - Answers

1. An Advanced Shipping Notification is based on a Purchase Order.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

2. Which one of the following objects is required for posting the goods receipt in SAP EWM?

   Choose the correct answer.

   ☐ A Purchase Order

   ☐ B Warehouse Task

   ☒ C Inbound Delivery

   ☐ D Store Location

3. The warehouse order contains one or more warehouse tasks or physical inventory items.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

4. A sales order usually comes from:

   Choose the correct answers.

   ☒ A CRM

   ☒ B ERP

   ☐ C SCM

   Correct. Sales Orders are usually generated in CRM or ERP.

5. Filters and limit values controls which products can be grouped together in the goods-issue zone.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False

6. An SAP EWM outbound delivery sends information about the goods issue posting back to ERP.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

   Correct. The SAP EWM outbound delivery sends information about the goods issue posting back to ERP, and the inventory management document and financial document are created from this information. In some cases, other financial documents are also created.

UNIT 3

Warehouse Monitoring and Processing with Mobile Devices

Lesson 1

Managing the Warehouse 60

Lesson 2

Outlining the Radio Frequency (RF) Framework 69

UNIT OBJECTIVES

- Use the Warehouse Management Monitor
- Create a tailored measurement service
- Create a calculated measurement service
- Integrate measurement services in the warehouse cockpit
- Plan warehouse excellence
- Execute processes with mobile devices in the warehouse

Unit 3
Lesson 1

Managing the Warehouse

LESSON OVERVIEW

In this lesson, we look at the Warehouse Management Monitor. You learn how to use the Warehouse Management Monitor, create measurement services and integrate them into the Warehouse Cockpit, and plan warehouse excellence.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Use the Warehouse Management Monitor
- Create a tailored measurement service
- Create a calculated measurement service
- Integrate measurement services in the warehouse cockpit
- Plan warehouse excellence

Warehouse Management Monitor Basics

The SAP EWM Warehouse Management Monitor is a central tool to keep warehouse managers informed about the current situation in the warehouse. This information enables them to take appropriate actions depending on the current warehouse situation.

The warehouse management monitor also contains alert-monitoring capabilities. These highlight any actual and/or potential problems in the warehouse, and provide exception-handling tools to help correct any problem situations.

The tool is highly customizable and the information displayed can also be extended. For example, you can create custom nodes and custom monitors. The following figure shows the basic screen layout of the Warehouse Management Monitor.

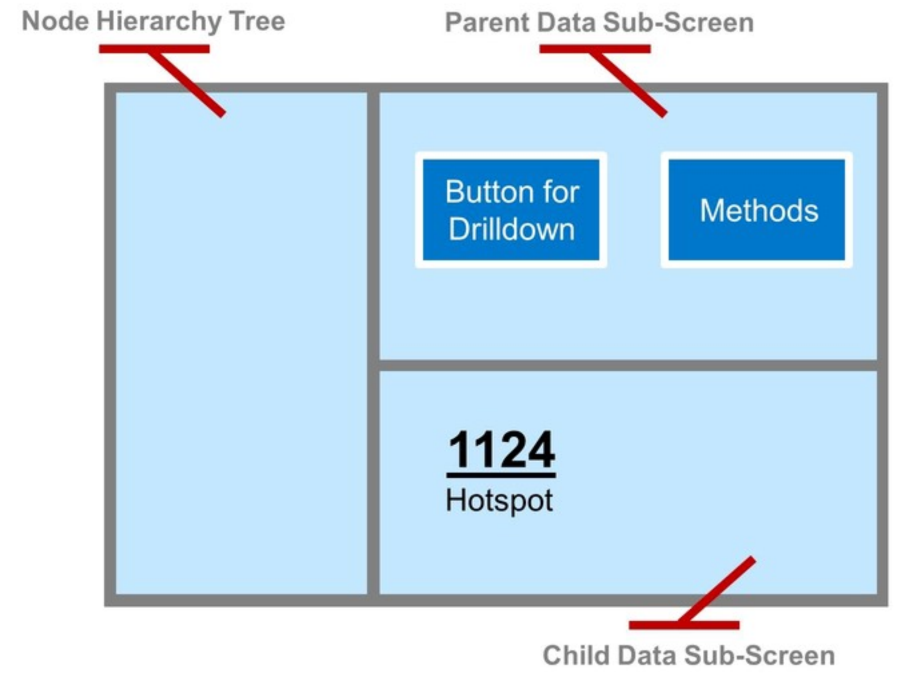


Figure 37: Warehouse Management Monitor

Hint:
With **hotspots**, you can jump directly to the details of the selected object. If you do not want the system to open a new mode for this, use the user parameter "/scwm/monnav" = "X".

SAP Warehouse Management Monitor

You can use the standard SAP Warehouse Management Monitor or you can create your own monitor in customizing. Regardless of whether you use the standard SAP monitor or your own monitor, you can tailor it to your needs by hiding nodes or creating new variant nodes based on the standard nodes. Creating variant nodes enables you to create your own nodes, which are based on standard nodes but with specific selection criteria or a specific layout.

By default, object information displays as a list view. The list view is displayed in an SAP List Viewer (ALV) grid, and it offers all standard ALV functionality, including sorting, filtering, and printing. You can toggle to form view for a selected object. The form view provides a focused view of the object, and more-detailed information than the list view. The form view is displayed in an HTML viewer.

There are different ways in SAP EWM to be notified about alert situations:

- Alert Nodes in the Warehouse Management Monitor
- Alerts in the SCM Alert Monitor

The Alert Node can for example show warehouse tasks that have not been completed within a certain time frame. The time parameter is set in the selection screen for the node.

The Warehouse Management Monitor is often used to display stock balances. Capacity-checks are also available for warehouse doors and staging areas. Physical and available stocks can be displayed using a variety of selection parameters from the Stock and Bin node. From the Warehouse Management Monitor, stocks are visible in the following locations:

- In storage bins
- On resources, for example forklifts and pick HUs
- In transportation units (TUs) that are in the yard
- In the Difference Analyzer in physical inventory processing

Warehouse Management Monitor Layout

The Warehouse Management Monitor screen is divided into three sections:

Node Hierarchy tree The node hierarchy tree contains all predefined nodes. These nodes represent different object classes. The hierarchy tree is used for navigation. You can use the tree to display information from a selected node in the upper right frame. This information can be based on selection criteria. The warehouse management monitor contains nodes for object classes relating to the following:

- Documents, such as warehouse requests (WRs), warehouse orders (WOs), warehouse tasks (WTs), and physical inventory documents
- Processes, such as stock and bin and resource management processes
- Alerts, such as overdue waves or overdue deliveries without goods issue or goods receipt

You can also switch on and off the display of the hierarchy tree to use the full screen for the other sections.

Upper-Right Frame: This is where parent data displays on the warehouse management monitor. This shows high-level information about the node that you select.

Lower-Right Frame: This is where child data displays on the warehouse management monitor. This allows you to drill-down to the detailed information about the parent. It allows you to continue drilling-down until you have come to the lowest-level of information available.

Measurement Services

Analytics

Use Measurement Services to define your own key figures for the warehouse that are supported by the system. You can map your key figures using tailored and calculated measurement services (TMS and CMS). Start these tools from the Start Measurement Services program. You can schedule this program to run regularly.

Examples of warehouse key figures include:

- Outbound deliveries that have left the warehouse over 24 hours late
- Number of open physical inventory documents that are over 24 hours old
- Number of handling units that are in goods receipt

A measurement service performs a query and returns a key figure. Basic, tailored, and calculated services can be built, used by other SAP EWM applications, and extracted to SAP BI. The key figures that are returned (by the query) are used in the these functions:

- Warehouse management monitor, for creating a tailored measurement service (TMS) under certain conditions
- Operational planning in Labor Management and for calculating engineered labor standards
- Warehouse Cockpit, to monitor results graphically
- BI Content of Extended Warehouse Management

Basic measurement services (BMS) can be grouped together based on business requirements such as inbound, outbound, VAS, and transportation requirements.

SAP delivers BMS groups and several individual BMS functions. A BMS is a function module and you can create additional BMS functions.

Tailored Measurement Service (TMS)

A tailored measurement service (TMS) is based on a basic measurement service (BMS) that you choose. You add special selection criteria to the BMS, such as the activity area, by creating a selection variant. The result is a key figure in the base unit of measure of the warehouse.

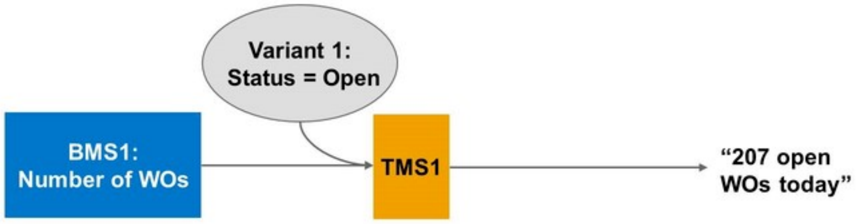


Figure 38: Example Tailored Management Service

Calculated Measurement Service

A calculated measurement service (CMS) is a reuse of a tailored measurement service to build more complex formulas.

A calculated measurement service involves a calculation that uses one or more formulas.

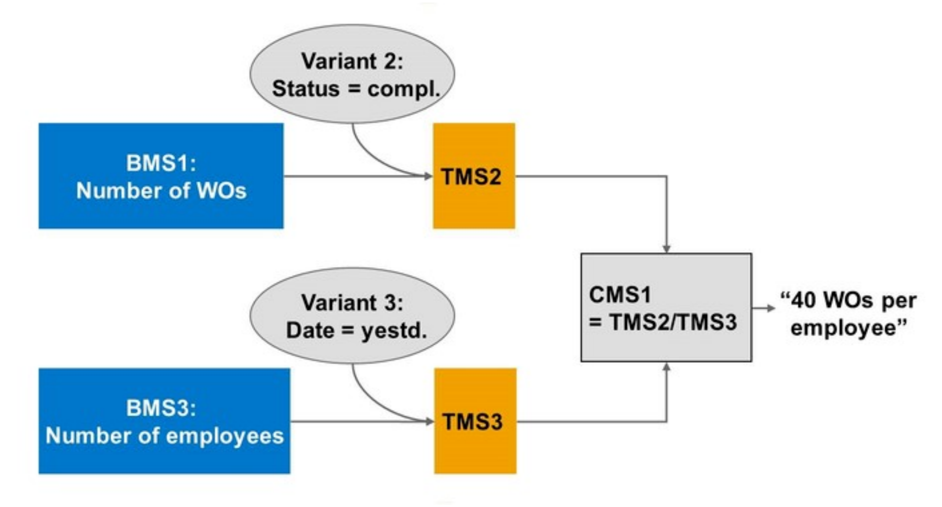


Figure 39: Example Calculated Measurement Service

A measurement service:

- Can be evaluated (reported)
- Returns a numeric value. In the case of non-numeric values, 1 is returned
- Can be used in the Easy Graphics Framework (EGF) or by other KPI reporting tools
- Contains functionality to evaluate and list results
- Can be used to trigger alerts

The figure, Calculated Measurement Service, shows an example of using tailored and calculated measurement services. Each morning, the warehouse manager wants to know the number of warehouse orders that a processor executed on the previous day. To calculate that, the manager:

1. Defines a TMS based on the required BMS.
    - Selects BMS 1 (Number of Warehouse Orders) and BMS 2 (Number of Processors).
2. Adjusts these BMSs to match the requirements, by creating selection variants 1 and 2.
3. Creates CMS 1 in the formula editor. This formula divides TMS 1 by TMS 2. As a result, the average number of warehouse orders per processor is calculated. For example, 40 warehouse orders per processor.

Integrating Measurement Services in Warehouse Cockpit

Measurement Services can be scheduled to run periodically in the background. The results can be saved in a local file on a PC or in a logical file on the server.

The measurement service results can be displayed in the Warehouse Cockpit, where they are automatically refreshed.

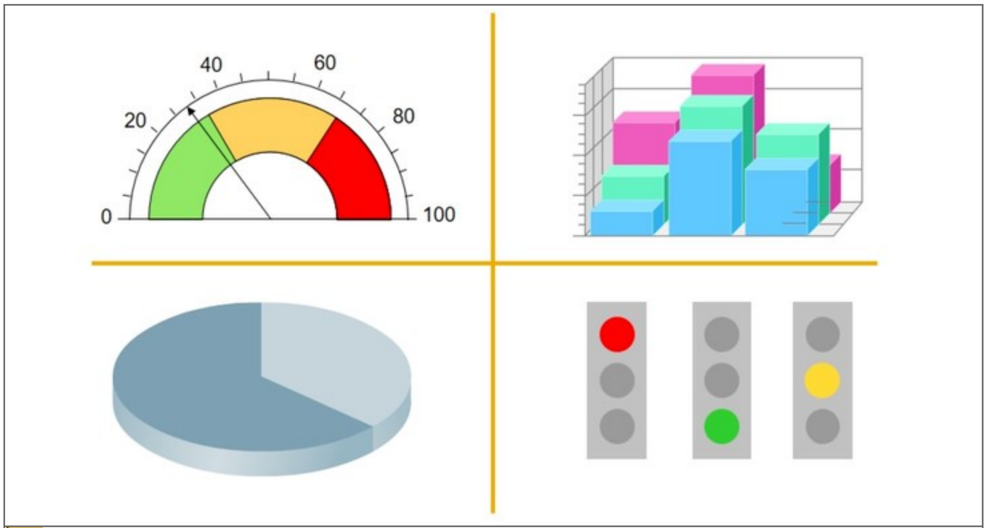


Figure 40: Warehouse Cockpit

Analytics and Planning

To plan your workers better and to develop your warehouse strategy, you use SAP NetWeaver Business Warehouse. This enables you to analyze and compare warehouse data and to perform strategic planning and simulation based on delivery data.

BI Content and BI Content Extensions are delivered as an add-on to SAP NetWeaver Business Warehouse. They are a pre-configured set of role and task-related information models that are based on consistent metadata in SAP NetWeaver Business Warehouse. BI Content provides selected roles within a company with the information that the roles need to perform their tasks.

These information models include workbooks, queries, InfoSources, InfoCubes, DataStore objects, key figures, characteristics, update rules, and extractors for SAP applications.

BI Content and BI Content Extensions can:

- Be used in specific industries without the need to modify it
- Be adapted so that you can work with it to any degree of detail
- Serve as a template or as an example for customer-defined BI Content and BI Content Extensions

The BI Content for EWM includes, but is not limited to, the following data flows:

- Measurement Service Results
- Executed Workload
- Exceptions
- Warehouse Order - Warehouse Task
- Delivery Items
- Storage Bins
- Value-Added Services

- Strategic Planning

You can use strategic planning to perform long-term planning based on your historical data. You can change values, and conduct planning based on these changed values, for example, to calculate the number of workers required for each month of the year.

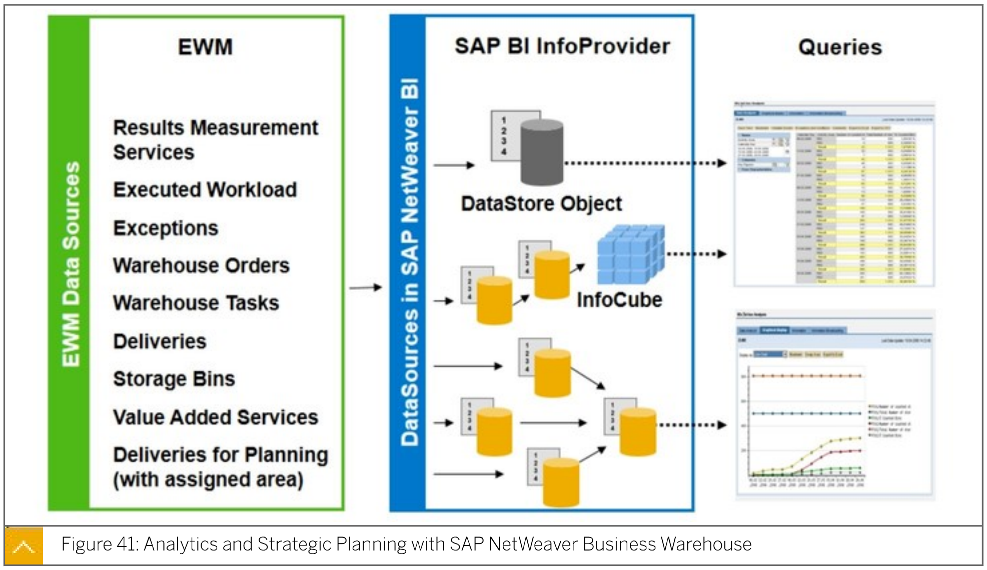


Figure 41: Analytics and Strategic Planning with SAP NetWeaver Business Warehouse

Proof of Delivery (POD)

To verify the picking and outbound worked as requested, the proof of delivery is a valuable tool. When you use SAP ERP, the proof of delivery is registered in the ERP system and can be uploaded into SAP EWM. You can then use the Warehouse Management Monitor to review these PODs. The data can also be uploaded to SAP Business Information Warehouse for reporting purposes to see information on a daily, weekly, or monthly basis.

Warehouse Costs and Full-Time Equivalents (FTEs)

SAP EWM offers the possibility to maintain the daily average number of full-time equivalents (FTEs) working in the warehouse, the labor costs per FTE per day, and the daily fixed costs for your warehouse. This information can be used for analysis purposes in BI. The defined query provides information such as:

- Daily average ratio of the number of outbound delivery items per FTE
- Daily average ratio of total costs per outbound delivery item
- Labor costs per FTE, fixed costs, and total costs for the warehouse
- Daily FTE average

Business Intelligence (BI) with SAP HANA EWM

SAP HANA Live provides a new quality of analytics and reporting capabilities for the SAP Business Suite. It defines access to applications like SAP EWM through standard protocols and interfaces (OData, SQL, and MDX), exposes a data model that is easy to understand (with business semantics instead of technical DB field names), and is tailored to analytical use cases. However, this data model stems from the table design of existing suite solutions, like SAP EWM. The data model of SAP's Business Suite – generally optimized for data throughput in transactional scenarios – has been adapted for SAP HANA analytics to support easy consumption based on operations provided by the SAP HANA database. This adaptation has been achieved by the definition of a layered set of database views, which is referred to as the virtual data model (VDM). The top layer of VDM provides customers and partners with views that they can consume easily using various tools (for example, BOBJ tools) or technologies (for example, SAP Smart Business or HTML5).

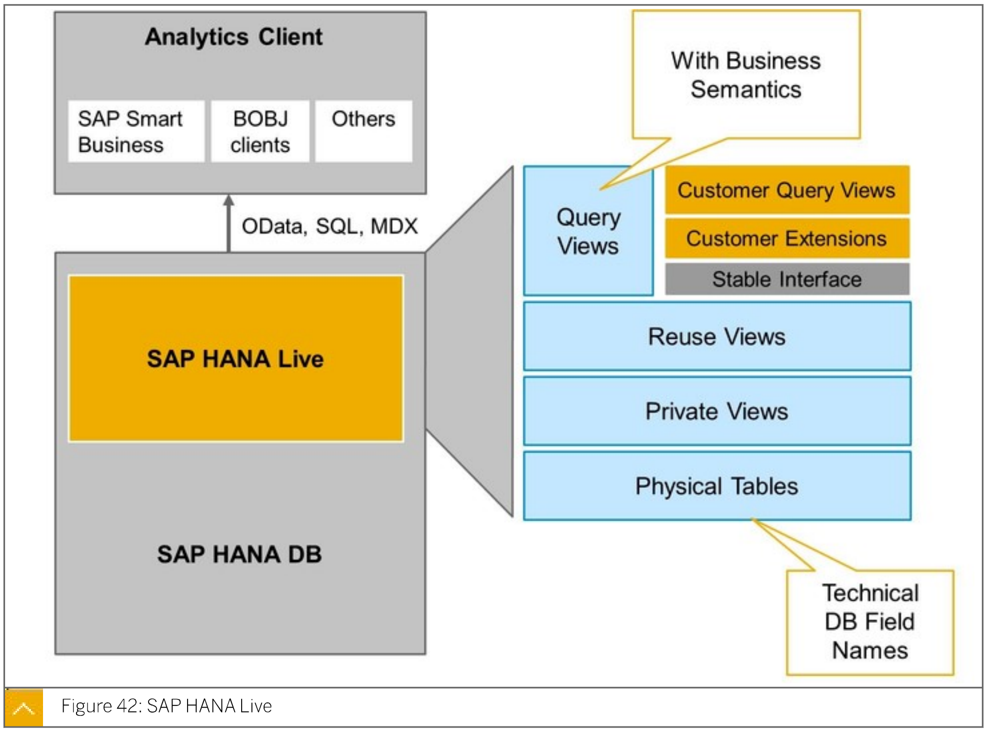


Figure 42: SAP HANA Live

Note:
SAP HANA Live can be used for EWM based on SCM, not for a S/4HANA decentral or embedded EWM.

SAP S/4HANA Embedded Analytics

With the seamless integration of analytics features in SAP S/4HANA, you can benefit from a variety of analysis options in an environment with simplified data model, new user experience, advanced processing and deployment options suitable to your business needs. Often transactions and analytics are handled separately. But in most cases, business processes consists of a recurring sequence of transactions and analytics, so that analytics are embedded in the daily work with transactional data.

All the analytical tools consume Core Data Services (CDS views), which make up the Virtual Data Model (VDM) of SAP S/4HANA. In addition, to use CDS views of type analytical queries, you must set up the Analytic Engine, which is used to evaluate and execute analytical queries at runtime.

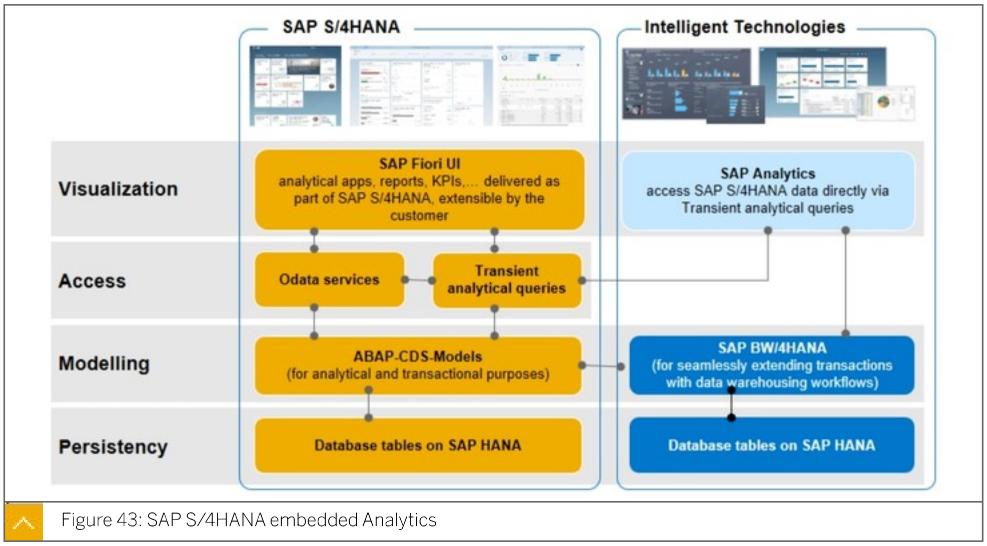

SAP S/4HANA
Intelligent Technologies
Visualization
Access
Modelling
Persistency
SAP Fiori UI
analytical apps, reports, KPIs,... delivered as part of SAP S/4HANA, extensible by the customer
SAP Analytics
access SAP S/4HANA data directly via Transient analytical queries
Odata services
Transient analytical queries
ABAP-CDS-Models
(for analytical and transactional purposes)
SAP BW/4HANA
(for seamlessly extending transactions with data warehousing workflows)
Database tables on SAP HANA
Database tables on SAP HANA

Figure 43: SAP S/4HANA embedded Analytics

The end user can use the SAP Fiori Launchpad to access both transactional and analytical applications coming from SAP S/4HANA system. The user can navigate between the applications, which enables insight to action in real time without need for data replication.

The Embedded Analytics approach is recommended for operational reporting, not for historical data reporting. For this purpose and also to include other data sources, you still use SAP BW.

Warehouse KPIs - Operations

With the *Warehouse KPIs - Operations* app, you can view an overview of key performance indicators (KPIs) relevant to your warehouse operations, for example, the total number of open warehouse tasks to be processed on the current date. On the overview page, you can see different types of KPI cards. As a warehouse clerk, these cards help you to better manage and process your daily tasks.

LESSON SUMMARY

You should now be able to:

- Use the Warehouse Management Monitor
- Create a tailored measurement service
- Create a calculated measurement service
- Integrate measurement services in the warehouse cockpit
- Plan warehouse excellence

Unit 3
Lesson 2

Outlining the Radio Frequency (RF) Framework

LESSON OVERVIEW

This lesson describes the use of the radio frequency framework. In this lesson, you learn how to execute processes with mobile devices in the warehouse.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Execute processes with mobile devices in the warehouse

The RF Framework

The radio frequency (RF) framework provides flexibility to define the layout of the RF screen and also to define a sequence of activities and process steps. The RF Framework enables integration of mobile devices and provides enough flexibility to perform adjustments.

Independent of the manufacturer or the screen size, you can create screen templates and merge them into a "display profile". This display profile is assigned to the device.

Figure 44: Using Mobile Devices

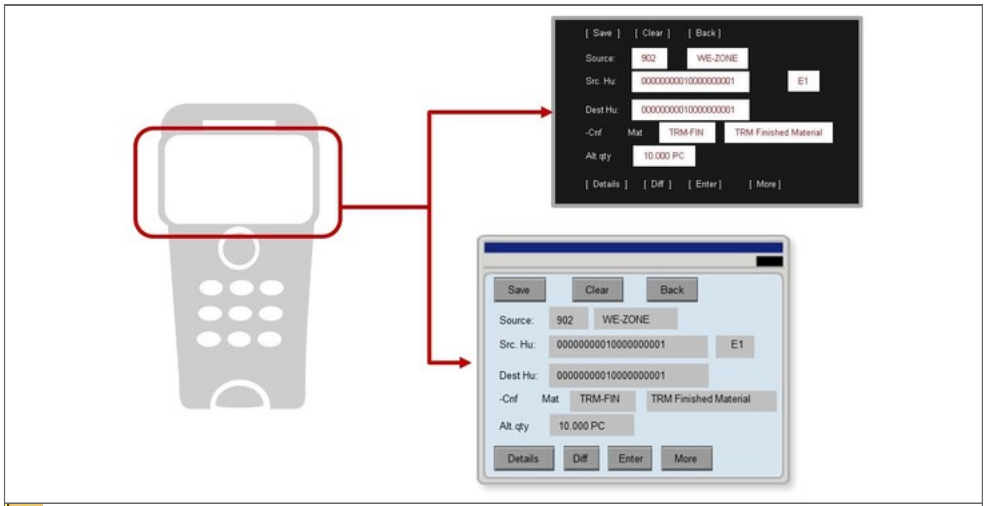
With different profiles, device and customer-specific adjustments can be performed. This profile makes the RF framework very flexible regarding device size, device type, and user-dependent requirements. The RF framework enables personalized menus and flexible, user-friendly, personalized screens. Depending on the input (for example, verification data, input data, keystroke, or logon request), the appropriate service is started.

Browser and GUI Support on Graphical Devices

The RF framework supports both graphical user interface (GUI) and character-based devices, as well as browser-based devices. GUI Microsoft Windows-based devices are connected to the SAP System just like any other client-dependent PC. Options can be operated by touch-screens or by using a keyboard.

Character-based devices are linked to the system through SAPConsole. SAPConsole operates on a Windows NT/Windows 2000/XP platform and it interacts with the RF terminals connected to it. This concept is currently supported by the leading providers of RF terminals.

The system uses ITS Mobile for connecting browser-based or Windows CE devices.


[Save] [Clear] [Back]
[Details] [Diff] [Enter] [More]
Save
Clear
Back
Details
Diff
Enter
More

Source: 902 WE-ZONE
Src. Hu: 00000000010000000001 E1
Dest Hu: 00000000010000000001
-Cnf Mat TRM-FIN TRM Finished Material
Alt.qty 10.000 PC

Source: 902 WE-ZONE
Src. Hu: 00000000010000000001 E1
Dest Hu: 00000000010000000001
-Cnf Mat TRM-FIN TRM Finished Material
Alt.qty 10.000 PC

Figure 45: Character Based or Browser Based Devices

Screen Format for RF (Device-Independent)

Independent of the manufacturer or the device type, all screen forms use a common format.

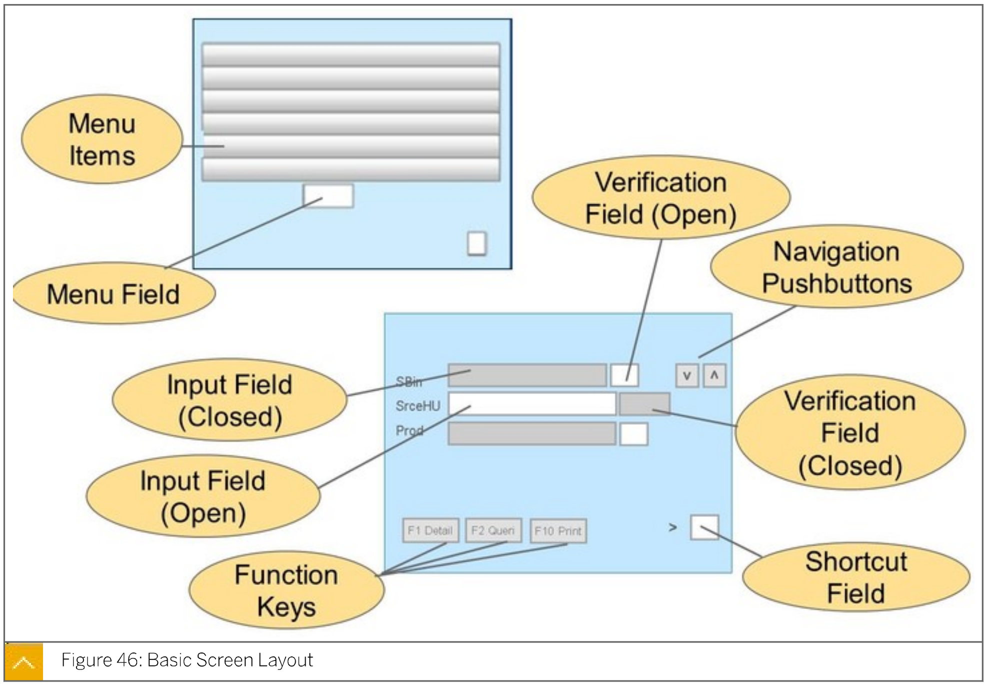


Figure 46: Basic Screen Layout

The RF framework supports the use of bar codes for identification and verification purposes. SAP currently supports EAN 128 bar code types, but the RF framework supports other types (once customized in the Mobile Data Entry activity).

Using the RF Screen Manager, you can customize the appearance of RF presentation screens. This ensures that they are consistent with the attributes of the presentation devices in use. Although SAP provides a standard menu and menu hierarchy, you can also define your own menus and menu hierarchy for the RF device transactions by using the RF Menu Manager.

RF Functionality

The SAP RF framework provides standard RF functionality, which includes the following tasks:

- Logon
- Logoff
- Recovery
- Work execution transactions for the following warehouse processes:
  - Picking
  - Putaway
  - Loading
  - Unloading
  - Deconsolidation
  - Packing

- Physical Inventory
- Replenishment

RF Function Keys

In the basic navigation of the RF framework, SAP provides functions that are triggered using function keys. The standard function keys that are pre-configured by SAP are shown in the following table.

Function	Function Key	Description
More	F5	Displays the next pushbuttons in the sequence (in the case of more than four pushbuttons per screen)
Clear	F6	Clears a selected input field, or all input fields
Back	F7	Returns to previous screen or step
List	F8	Displays the list screen (showing possible input values) for a selected field
Full Message	F9	Displays the full message on a separate screen

The standard function keys can be changed in SAP EWM Mobile Data Entry customizing. Transaction-specific function keys are displayed in the function key line. If more than four function keys/pushbuttons exist for a screen, “>” is displayed. You can then choose the F5 function key to display the other pushbuttons.

The log on process begins with the execution of the SAP EWM transaction `/SCWM/RFUI`. The log on user ID must be a registered SAP system user and be assigned to a resource in SAP EWM master data.

Using RF After Log On

After the user is confirmed by the system, the main menu is displayed and that user can navigate to the desired transaction. The user either enters each step using the menu or enters the number of the step and confirms by pressing Enter. For example, if a user wants to putaway an incoming HU, the following two choices are available:

- Choose options *03 Inbound Processes* , (Enter) ,*03 Putaway* , (Enter), *01 Putaway By HU* (Enter) and finally, enter the HU number.
- Enter the menu path code **`331`**.

If the user is logged on to the RF environment, the resource, the stock on the resource, and the selected warehouse orders can be tracked in the Warehouse Management Monitor.

Usually, the data entry is done by bar code scanning, which includes an automatic Enter. With bar code scanning, the transactions work without any manual input.

Shortcut field: In a case where the warehouse situation differs from the proposed values, the worker presses the shortcut field to enter an exception or to execute function codes (as would happen by pressing a function key).

In SAP Extended Warehouse Management (EWM), you use exception codes to describe exceptional situations in the warehouse. You can define the following exception codes for different document types, for example, for inbound deliveries or outbound deliveries:

- Product shortages during goods receipt
- Product shortages during picking (pick denial)
- Other warehouse situations where processing abnormalities occur

Exception Code Processing

Combined with the exception code processing is the exception handler service. This can be configured to create corrective tasks, generate alerts, and/or record the exception for reporting purposes. Exception codes can be reported in the desktop user interface or in the RF user interface.

The following is an example of the use of an exception code. A warehouse task and subsequent warehouse order is created for picking a product based on an outbound delivery order. The warehouse task calls for picking 10 pieces of the material, but when the designated storage bin is located, there is no stock (pick denial). Based on the exception code entered, the exception code could be configured to one or more of the following activities:

- Create a bin replenishment
- Generate a workflow process to create e-mail notifications
- Direct the picker to another bin location for the product
- Accept the pick denial and proceed to the next product pick task

The SAP EWM system can be customized to react to an exception code depending on the resource. For example, during the pick denial processing outlined above, an experienced warehouse user might be directed to replenish the bin, then complete the pick. An inexperienced warehouse resource might be directed to move to the next warehouse task.

Pick by Voice

Instead of using a device with a display, it is also possible to use Pick by Voice technology. The graphical representation is replaced by voice commands, a scanner can still be used if required, but this technology has the advantage that the user can work hands-free.

The Pick by Voice transaction uses SAPGUI Dynpros whose fields have speech properties. From these Dynpros, the system generates HTML templates using the ITS HTML template generator, Mobile Device with Speech Input. These HTML templates contain speech-specific tags that are interpreted by the web browsers on the device.

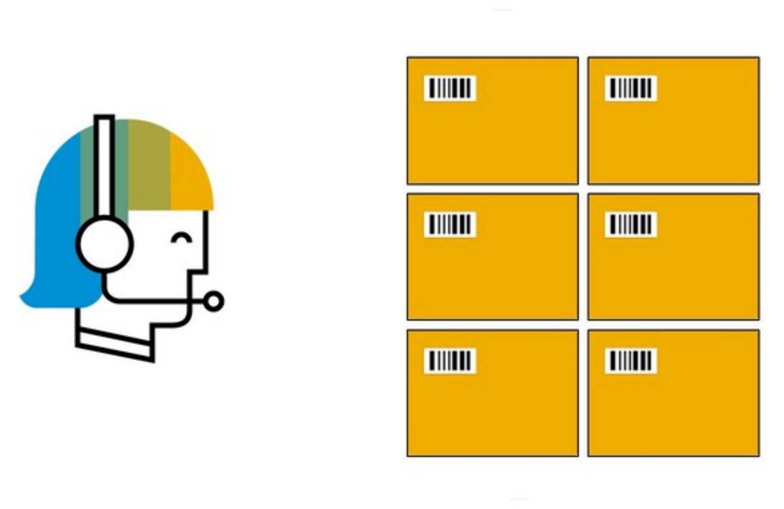


Figure 47: Pick By Voice

Working with Smart Glasses

The combination of both worlds – having a graphical display, a scanner and Pick by Voice – can be achieved by using smart glasses and the help of augmented reality. Augmented reality means that you have a view on the real world (in this case the warehouse), enhanced by computer information (for example, to which bin the picker has to go to).

The available smart glasses include scanner and Pick by Voice software, this way a complete hands-free work process is possible.

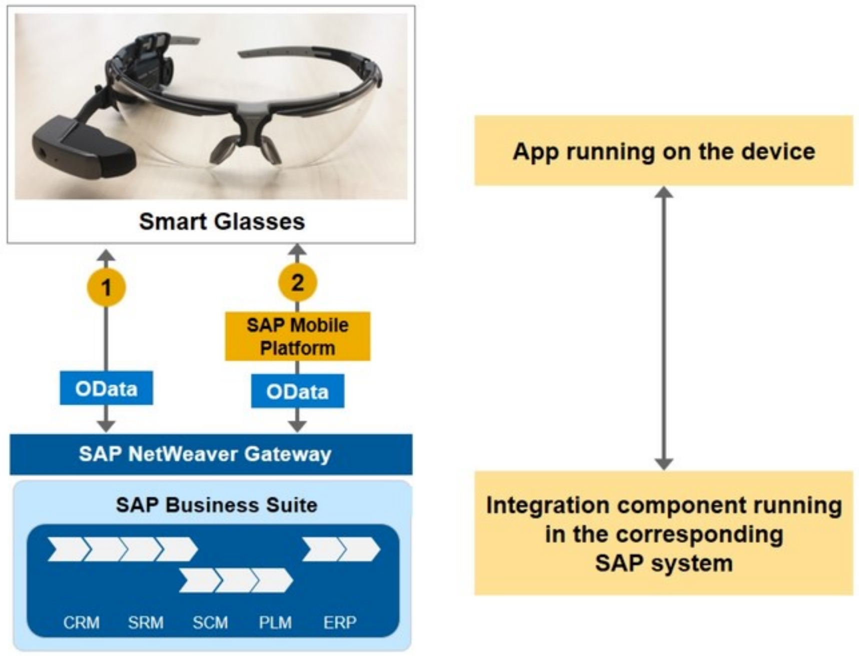


Figure 48: Augmented Reality Warehouse Picker

Resource Management

Working with mobile devices is tightly integrated with **Resource Management** A resource is an entity representing a user or equipment that can execute work in the warehouse. A resource can log on to a radio frequency (RF) or non-RF environment. Once the resource is logged on to the system, it can receive work for execution and it can be tracked and displayed in the warehouse management monitor.

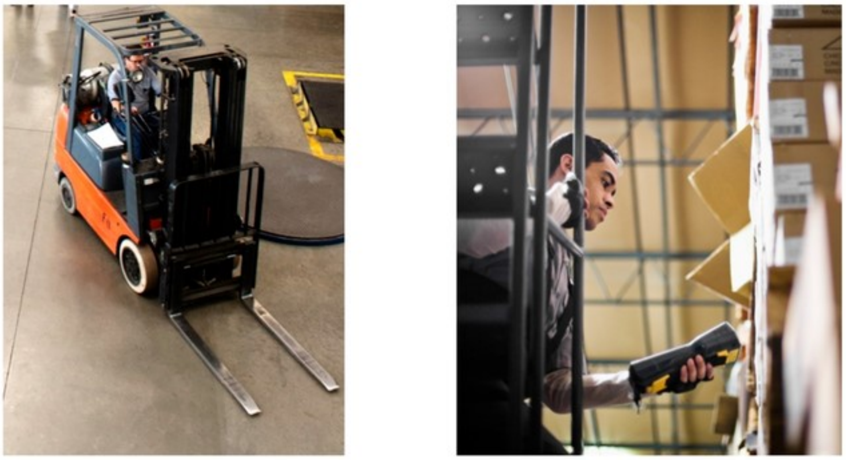


Figure 49: Resources In SAP EWM

Resource managementmaximizes the efficiency of warehouse processes by:

- Facilitating the management and distribution of work using queues
- Enabling the execution of work by resources in an RF and non-RF environment
- Optimizing the selection of warehouse orders for resources requesting work
- Enabling effective monitoring and controlling of resources

A resource belongs to a resource type (a grouping of resources with similar technical or physical qualifications) and a resource group (a grouping of resources for queue assignment purposes).

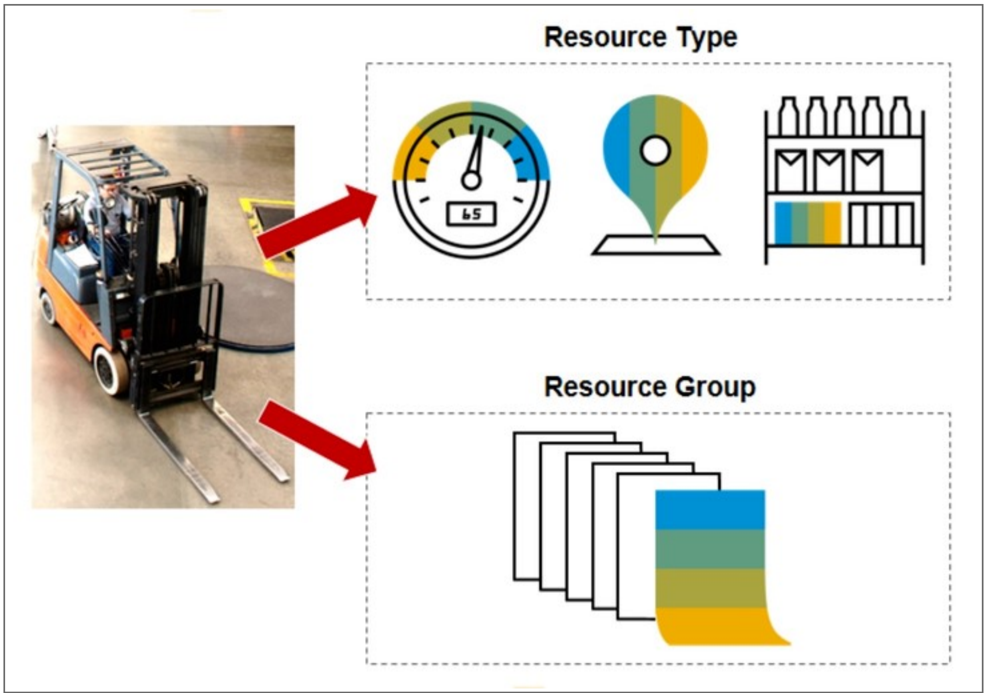


Figure 50: Resource Setup

Resource Type

A resource type is a grouping of resources with similar technical or physical qualifications.

The resource type determines the following for its corresponding resources:

- Horizontal and vertical velocity

  The velocity of a resource can influence the latest starting date (LSD) of a warehouse order.

- Applicability of position management

  Position management enables an RF device user to validate HUs by their position number, rather than by their HU number. This is particularly useful when the HU number tags are not readily accessible, such as when the HUs are stacked on top of each other.

- Qualifications and preferences (reflected by priority values) regarding bin access types and HU type groups.

Resource Group

A resource group is a grouping of resources for queue assignment purposes. The resource group determines the sequence of allowed queues for its corresponding resources, which can influence which warehouse orders are selected for a resource.

To use system-guided processing, the queues must be assigned to the resource groups in the desired sequence. As the WOs are selected from the queues according to the queue sequences, this represents a prioritization of the WOs for this resource type.

LESSON SUMMARY

You should now be able to:

- Execute processes with mobile devices in the warehouse

Unit 3

Learning Assessment

1. The EWM Warehouse Management Monitor is a customizable, central tool:

   Choose the correct answers.

   ☐ A Providing alert-monitoring capabilities

   ☐ B To keep warehouse managers informed about the current situation in the warehouse

   ☐ C Planning resources for the warehouse

2. A measurement service performs a query and returns a query.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

3. A Calculated Measurement Service always returns a numeric value.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

4. BI Content and BI Content Extensions are a pre-configured set of role and task-related information models that are based on consistent metadata in SAP NetWeaver Business Warehouse.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

5. If the user is logged on to the RF environment, the warehouse management monitor cannot be used for tracking.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

Unit 3

Learning Assessment - Answers

1. The EWM Warehouse Management Monitor is a customizable, central tool:

   Choose the correct answers.

   ☒ A Providing alert-monitoring capabilities

   ☒ B To keep warehouse managers informed about the current situation in the warehouse

   ☐ C Planning resources for the warehouse

   Correct. The EWM Warehouse Management Monitor has alert-monitoring capabilities and it keeps warehouse managers informed about the current situation in the warehouse. It does not plan warehouse resources (though the knowledge gained from using the tool can be used to help with planning).

2. A measurement service performs a query and returns a query.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False

   Incorrect. A measurement service performs a query and returns a key figure. The key figure returned (by the query) is used in scenarios such as other calculations.

3. A Calculated Measurement Service always returns a numeric value.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

4. BI Content and BI Content Extensions are a pre-configured set of role and task-related information models that are based on consistent metadata in SAP NetWeaver Business Warehouse.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

5. If the user is logged on to the RF environment, the warehouse management monitor cannot be used for tracking.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False

UNIT 4

Additional Functions in SAP EWM

Lesson 1

Applying Storage Control 84

Lesson 2

Employing Serial Numbers 92

Lesson 3

Processing Batches 96

Lesson 4

Mapping Quality Inspection Processes 102

Lesson 5

Applying Value-Added Services 106

UNIT OBJECTIVES

- Apply storage control
- Execute an inbound process with process-oriented storage control
- Execute an outbound process with process-oriented storage control
- Execute an inbound process with layout-oriented storage control
- Define serial numbers
- Use serialized products with SAP EWM
- Create batches in inbound processes
- Select batches in outbound processes
- Control the goods with the Quality Inspection Engine
- Connect the quality inspection engine and SAP ERP QM
- Execute value-added services

- Execute a kit-to-order process

Unit 4
Lesson 1

Applying Storage Control

LESSON OVERVIEW

In this lesson, we look at the basic methods of storage control in SAP EWM. With storage control, you can define and control the process steps in individual processes such as goods receipt, goods issue, or internal stock transfers.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Apply storage control
- Execute an inbound process with process-oriented storage control
- Execute an outbound process with process-oriented storage control
- Execute an inbound process with layout-oriented storage control

Complex Processes

In a warehouse, many of the movements are complex and they often require several interim storage bins. (These are not just simple moves from one area to another). There are various possible reasons for this complexity, for example:

- Additional processes may be necessary.
- The layout of the warehouse might not allow a direct movement.

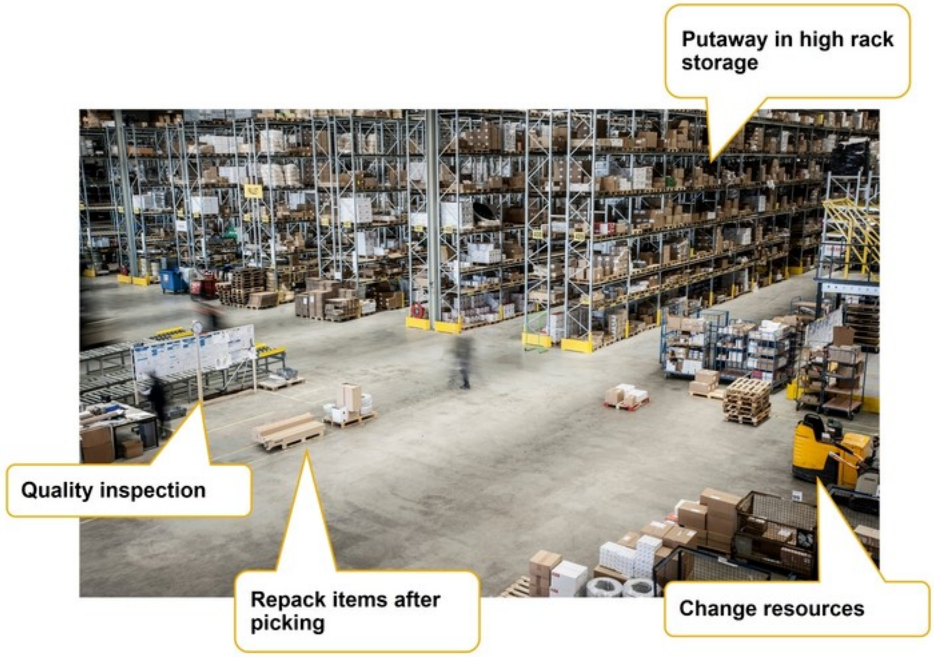


Figure 51: A Complex Warehouse Requires Complex Movements

Process-Oriented Storage Control

The following are some examples of additional process steps that may be required in warehouse movements:

- Counting
- Quality Inspection
- Deconsolidation (unpacking into individual HUs)
- Value-added services
- Packing

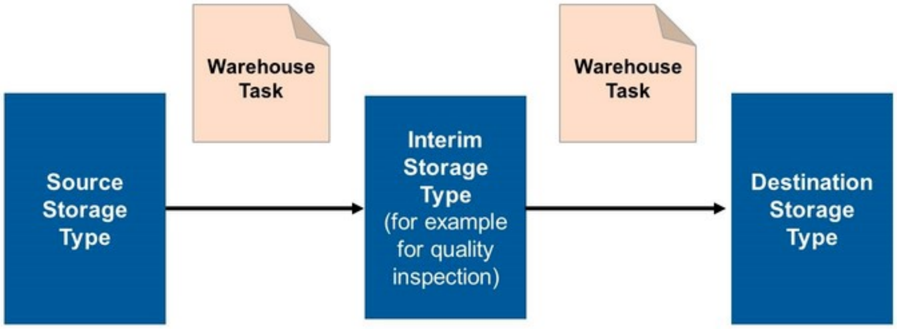


Figure 52: Warehouse Tasks for Process-oriented Storage Control

Moving a Product within Storage Control

SAP EWM can map these requirements through the use of process-oriented storage control. With process-oriented storage control, you define a complete process and describe the individual steps that must be executed. This means that the incoming or outgoing product is moved from the source storage bin to another storage bin where additional work is performed.

From there, the product is transferred to one of the following bins:

- Another storage bin where further work is performed.
- The final storage bin (inside the warehouse or in a goods-issue zone).

When moving a product within storage control, the product must be packed in a handling unit and the handling unit is moved using handling unit warehouse tasks.

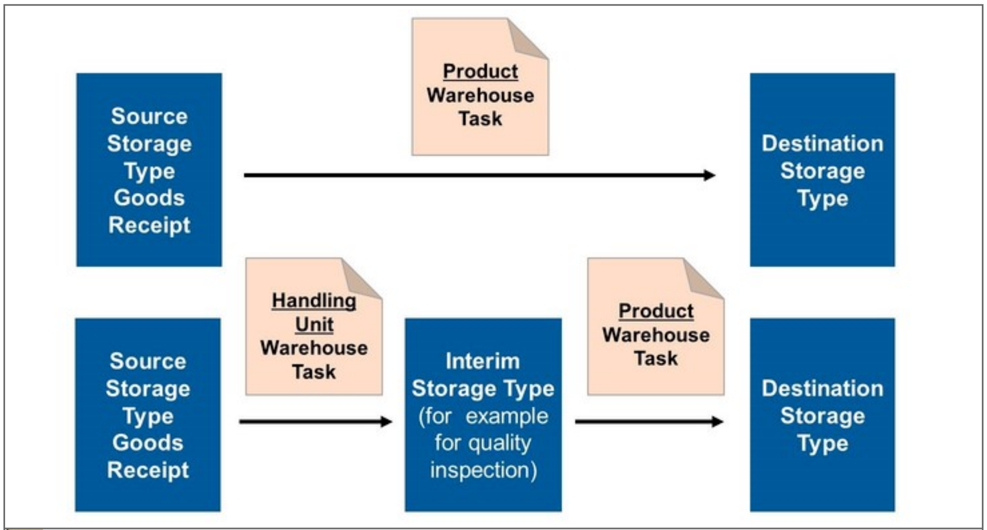

Product Warehouse Task
Source Storage Type Goods Receipt
Destination Storage Type
Handling Unit Warehouse Task
Product Warehouse Task
Source Storage Type Goods Receipt
Interim Storage Type (for example for quality inspection)
Destination Storage Type

Figure 53: Differences in Warehouse Tasks for Inbound Processes

Customizing

Depending on the direction of the movement, the *product* warehouse task is either at the beginning or the end of the total physical movement. In a putaway process the **final** WT is a product warehouse task, in a picking process the **first** WT is a product warehouse task. All other WTs are handling unit warehouse task.

> Note:
> This does not mean that HUs can only be moved with storage control. Also a direct movement without process can include a handling unit. But then it is still moved with a product warehouse task.

Based on your Customizing settings, a warehouse task is created from one intermediate storage type to the next intermediate storage type, or to the final destination storage type.

You can customize the process so that, once a warehouse task is confirmed, the next warehouse task is automatically created. The final destination storage bin can be determined at the beginning of the putaway process or at a later point during the process. In situations where the destination storage bin is determined at the beginning, the bin is **blocked** so that it cannot be used by another process.

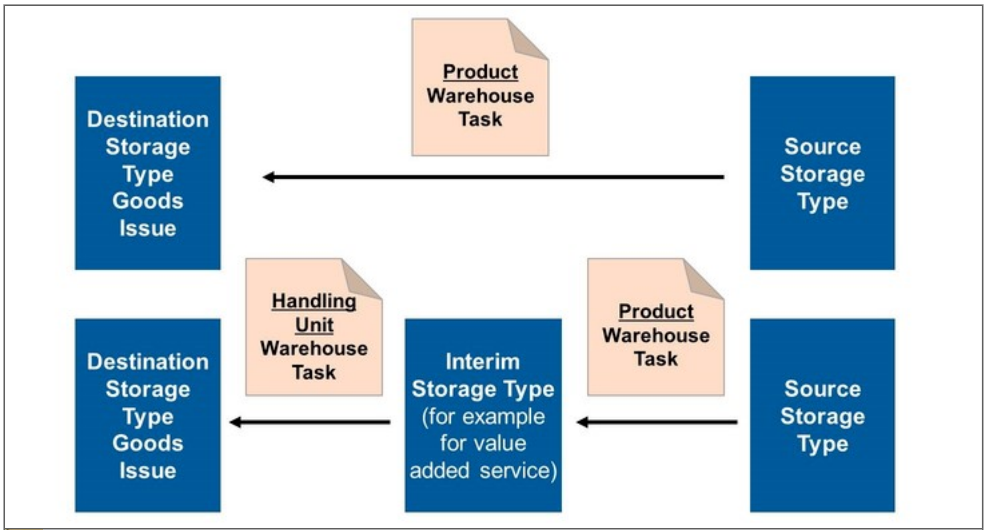

Product Warehouse Task
Destination Storage Type Goods Issue
Source Storage Type
Handling Unit Warehouse Task
Product Warehouse Task
Destination Storage Type Goods Issue
Interim Storage Type (for example for value added service)
Source Storage Type

Figure 54: Differences in Warehouse Tasks for Outbound Processes

Process Steps

As a prerequisite, the complete storage process is defined in customizing.

SAP delivers predefined internal steps. These are not changeable and they define the storage process type. Examples of internal steps are: loading, unloading, counting, packing, deconsolidation, putaway, and staging. The sequence of internal steps is predefined for each incoming or outgoing process or internal movement.

You can define as many external steps as you want. External steps must be assigned to a corresponding internal step. The external step can optionally detail the destination storage bin.

For each warehouse process, you define the sequence in which the external steps are to be executed.

Process-Oriented Storage Control in Inbound Processes

These are the steps for a goods receipt process with process-oriented storage control:

1. The transportation unit arrives at the warehouse door (St. Type: 9030, Bin: Door1)
2. Step IB01: A task is created to move the handling unit (HU) from the door (Door 1) to the goods receipt staging area (St Type: 9010, Bin: GR-ZONE).
3. Step IB02: There are multiple products in the HU. As a result of this, the system:
    a. Generates a task to send the HU to the deconsolidation work center (St. Type: 8010, storage section: 0001, storage bin DEKO).
    b. In the deconsolidation work center, the products are repacked in separate HUs.
4. Step IB03: The system generates a task to move the deconsolidated products to their final putaway bin.

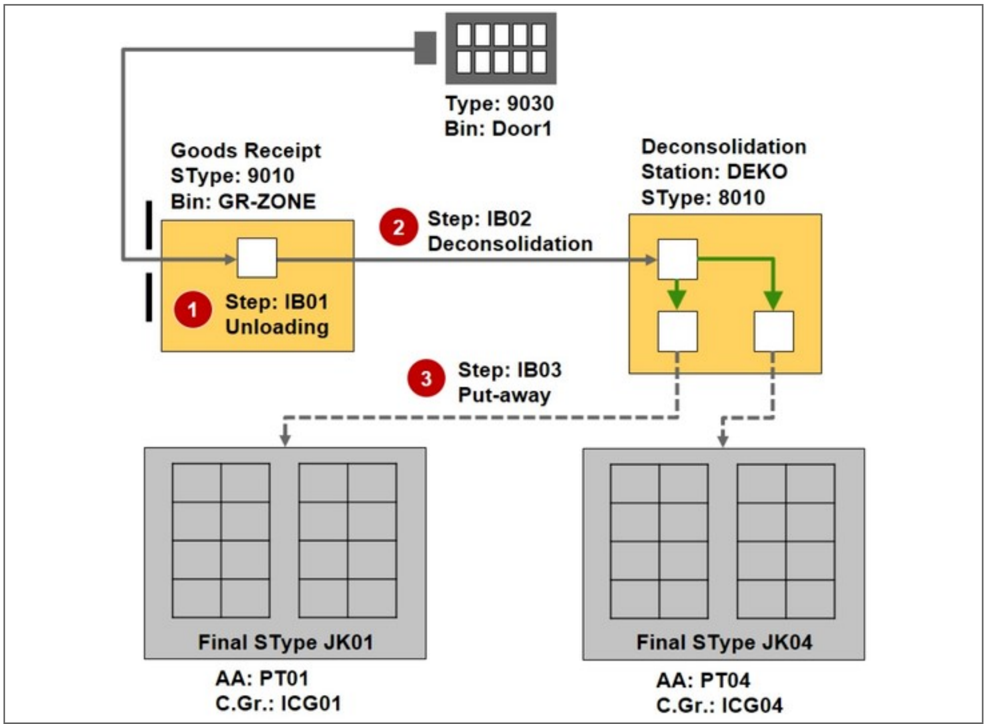


Figure 55: Process-Oriented Storage Control with Deconsolidation

For the items in the inbound delivery, SAP EWM determines the warehouse process type. For inbound processes, the warehouse process type also contains the storage process to be done.

Process-Oriented Storage Control in Outbound Processes

Process-oriented storage control can be used for picking processes also.

In the figure, Process-Oriented Storage Control with Packing – for Outbound Delivery, two products are stored in different storage bins which are assigned to different activity areas. These products are to be delivered to a customer. Each product is moved with a pick-HU to a packing work center. The pick-HUs are then consolidated into a single HU. Then, that consolidated HU is moved to the goods-issue zone and the truck can be loaded.

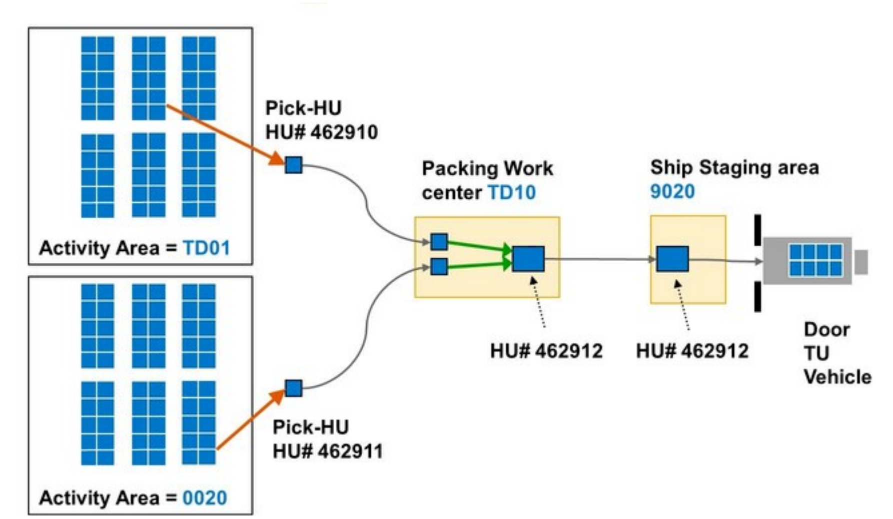


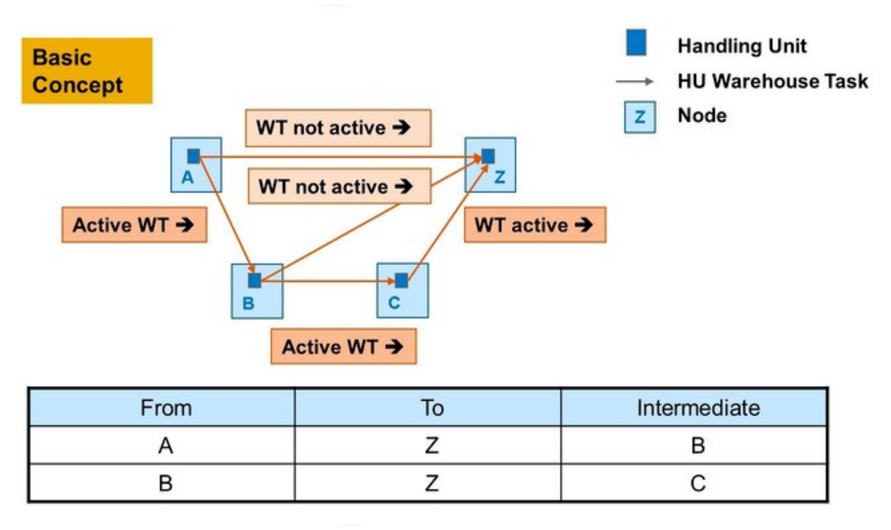
Figure 56: Process-Oriented Storage Control with Packing — for Outbound Delivery

In outbound processes, the warehouse process is derived from the warehouse order creation rule.

Layout-Oriented Storage Control

Layout-oriented storage control is normally used when stock movements in the warehouse do not travel directly from a source storage bin to a destination bin. Instead, they travel through one or several intermediate storage bins. This might be because of the physical layout of the warehouse or because an automated storage-retrieval system (AS/RS) is in use. For example, layout-oriented storage control is used in the Material Flow System to define conveyor segments.

The layout-oriented storage control requires handling units.



From	To	Intermediate
A	Z	B
B	Z	C

Figure 57: Layout-Oriented Storage Control for HU Movements

Identification and Pick Points

Identification Point(I-Point): A product pallet is to be moved from storage bin A (goods receiving area) to storage bin Z (high-rack storage area). The system should execute a contour and weight check to make sure that the pallet can be putaway in the high-rack storage area safely. For this activity, SAP EWM splits the warehouse order into separate tasks:

- The initial WT to move the product from storage bin A to storage bin Z is inactive, but the system creates an active warehouse task to interim storage bin B (which may be the identification point).
- When the WT from A to B is confirmed, the system changes the source bin for the inactive WT to B. Then, it checks if a direct movement is now possible. This is not the case in our example, so another WT is created, from B to C, and the first WT is still inactive.
- After the confirmation of the movement to C, the inactive WT is changed again to a new source bin and is now activated.

Note:
Please note that the above description refers to a typical MFS scenario, where the I-Point is a role of a *communication point*. There is also a storage type role for I-Point, which is also determined using layout-oriented storage control, but this works differently. With this kind of storage type the movement ends at the I-Point and the next WT has to be triggered separately.

Pick Point (P-Point): Due to the size, the weight, or other combinations, it is necessary to pick the complete HU (independent of the quantity that you actually want to deliver). In this case, the HU is moved to a pick point. There, the worker takes the required quantity out of the HU. The remaining HU can be moved to either the source bin or another storage bin. The quantity that was removed from the HU (for the delivery) is moved (after packing or additional work) to the goods-issue zone.

Use of process-oriented storage control can be combined with layout-oriented storage control. In this case, SAP EWM always executes the process-oriented storage control first. The layout-oriented storage control then checks whether the sequence of putaway or picking process steps is possible in layout view, and if required, adjusts the flow of the putaway or stock removal.

Sample Putaway Process Flow

For example, SAP EWM determined the following putaway process flow based on the process-oriented storage control:

1. Unloading at door
2. Counting at counting station
3. Putaway in the high-rack storage area

However, the layout-oriented storage control determines that a direct putaway in the high-rack storage area is not possible and that the putaway must use an identification point. Therefore, layout-oriented storage control could modify the tasks to be sequenced as follows:

1. Unloading at door

2. Counting at the counting station
3. Identification of goods at the ID point
4. Putaway in the high-rack storage area

LESSON SUMMARY

You should now be able to:

- Apply storage control
- Execute an inbound process with process-oriented storage control
- Execute an outbound process with process-oriented storage control
- Execute an inbound process with layout-oriented storage control

Unit 4
Lesson 2

Employing Serial Numbers

LESSON OVERVIEW

This lesson describes the use of serial numbers in SAP EWM. We look at the characteristics of serial numbers, and you learn how to define and use serial numbers.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Define serial numbers
- Use serialized products with SAP EWM

The Serial Number

A serial number is a character-string that is assigned to a piece of a material to differentiate that piece from all other pieces. The combination of product number and serial number is unique.

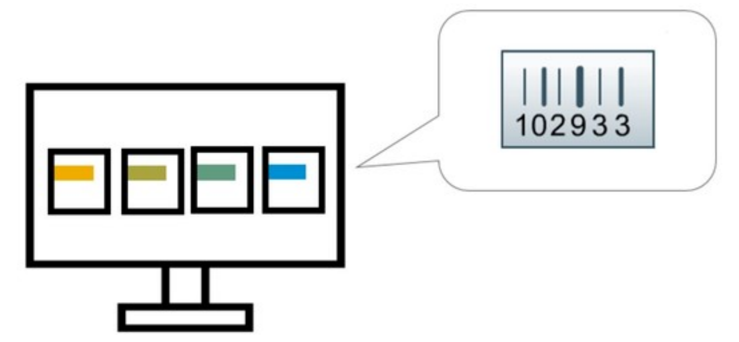


Figure 58: Serial Number Management

In SAP EWM, a serial number can be up to 30 characters in length. To remain compatible with ERP, the serial number length must be restricted to 18 characters. A BAdI is available to map the longer SAP EWM serial numbers to the ERP serial numbers if it is required.

Serial Number Profile

A serial number profile is a four-character code that is created in customizing. It determines the conditions and business transactions for issuing serial numbers to serialized products. You must assign a serial number profile in the product master records for products that require serial numbers.

There are two different serial number profiles that are maintained and assigned to the material master data in ERP. They are:

- The LES serial number profile that is maintained in the material master data view Sales: General/Plant.
  - This serial number profile is only relevant for ERP and is defined to use serial numbers in delivery documents.
- The serial number maintained in the view: WM Execution.
  - This is relevant for the use of serial numbers in SAP EWM.

> Hint:
> To maintain the additional tabs in the ERP material master data, the configuration of the material master might be necessary in ERP customizing.

Serial Number Requirement Types

Serial number profiles are defined warehouse-number independent. You can then additionally define serial number profiles with the same key, but different settings, for specific warehouses.

SAP EWM first searches for the warehouse-number dependent serial number profile. If no warehouse-number dependent serial number profile is found, the warehouse-number independent serial number profile is used. In this way, you can have a product that requires a serial number in one warehouse, but not in another warehouse. In this profile, four options for serial number requirement are available, which are:

- A - Serial Numbers for Document Items: The serial number is required only at the document level.
- B - Serial Numbers at the Warehouse-Number Level: Serial numbers are required for all goods receipts/issues and are maintained at the warehouse level.
- C - Serial Numbers required for every warehouse movement: The serial numbers are maintained at the bin level.
- D - No serial number requirement: This is mainly used when a product is serialized in some warehouses, but not in others.

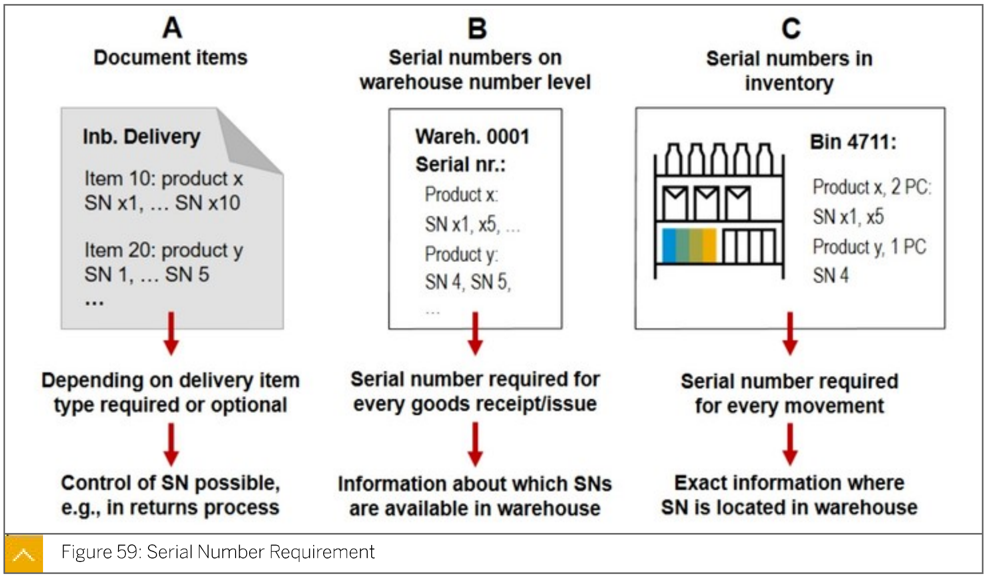

A
Document items
Inb. Delivery
Item 10: product x
SN x1, … SN x10
Item 20: product y
SN 1, … SN 5
…
Depending on delivery item type required or optional
Control of SN possible, e.g., in returns process
B
Serial numbers on warehouse number level
Wareh. 0001
Serial nr.:
Product x:
SN x1, x5, …
Product y:
SN 4, SN 5,
…
Serial number required for every goods receipt/issue
Information about which SNs are available in warehouse
C
Serial numbers in inventory
Bin 4711:
Product x, 2 PC:
SN x1, x5
Product y, 1 PC
SN 4
Serial number required for every movement
Exact information where SN is located in warehouse

Figure 59: Serial Number Requirement

Serial Numbers in Deliveries

EWM copies the serial numbers from the ERP System in both the goods receipt and goods issue processes.

Goods receipt process:

- In the goods receipt process, SAP EWM copies the serial numbers from the ERP inbound delivery into the inbound delivery.
  - A prerequisite for this is that you have determined the serialization for the product in the serial number profile. Otherwise, SAP EWM does not copy any serial numbers to the inbound delivery.
  - You can make changes to copied serial numbers in the user interface of the inbound delivery up until the goods receipt posting.
- If no serial numbers have been specified in the ERP inbound delivery, then you must specify the serial number before the goods receipt posting in accordance with the serial number profile in SAP EWM.

Goods issue process:

- In the goods issue process, SAP EWM copies the serial numbers from the ERP outbound delivery into the outbound delivery order.
  - A prerequisite for this is that you have determined the serialization for the product in the serial number profile. In other cases, SAP EWM does not copy any serial numbers into the outbound delivery order.
  - Unlike with the goods receipt process, you cannot make changes to copied serial numbers in the goods issue process.
- If no serial numbers have been specified in the ERP outbound delivery, then you must specify the serial number before the goods issue posting in accordance with the serial number profile in SAP EWM.

- For items with *Serial Number Requirement for Document Items* or *Serial Number Requirement at Warehouse Number Level* the serial numbers can be entered during the confirmation of the warehouse task or in the outbound delivery order.
- For items with *Serial Number Requirement in Inventory Management* the serial numbers have to be entered during the confirmation of the warehouse task and are copied into the outbound delivery order.

Provisional Serial Numbers

In general, serial numbers are entered before the goods receipt is posted. As this is not always desired or practicable, you can configure the system to use provisional serial numbers. Provisional serial numbers begin with a $ and have 30 characters. When posting the goods receipt, the provisional serial number is assigned. In the deconsolidation work center you must replace the provisional serial number with a final serial number.

Hint:
In this case, ERP is not updated with the real serial number. If you want to have serial numbers in ERP, then do not use provisional serial numbers.

LESSON SUMMARY

You should now be able to:

- Define serial numbers
- Use serialized products with SAP EWM

Unit 4
Lesson 3

Processing Batches

LESSON OVERVIEW

This lesson introduces the concept of working with batches in SAP EWM. We look at how you can use batches in both inbound and outbound processes.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create batches in inbound processes
- Select batches in outbound processes

Batch Management

In various industries, particularly in the process industry, you have to work with homogenous partial quantities of a material or product throughout the logistics quantity and value chain.

There are various reasons for this, including the following:

- Legal requirements

  For example, the guidelines set out by Good Manufacturing Practice (GMP) or regulations on hazardous material.

- Defect tracing, callback activities, and regression requirement
- The need for differentiated quantity-based and value-based Inventory Management

  For example, due to heterogeneous yield/result qualities or varying constituents in Production.

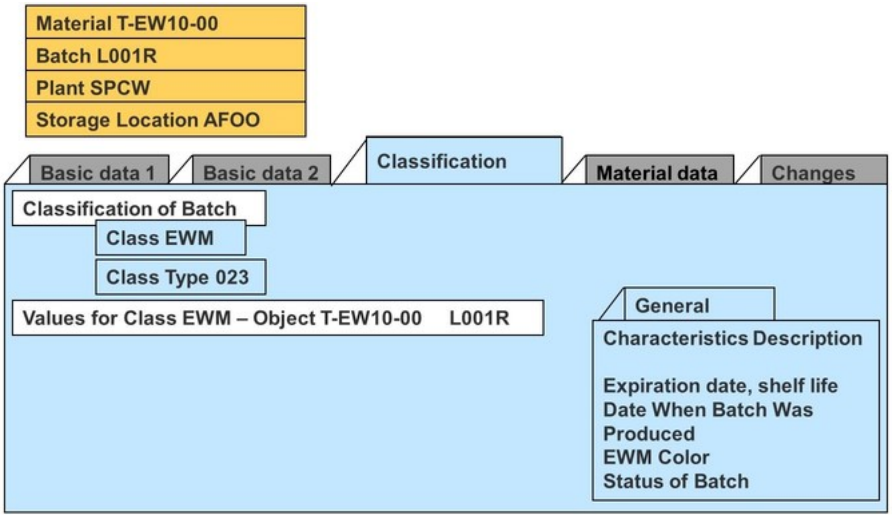
- Differences in usage and the monitoring thereof in materials planning in Sales and Production
- Production or procedural requirements

  For example, settlement of material quantities on the basis of different batch specifications.

A batch describes a quantity or partial quantity of a certain material or product that has been produced according to the same recipe, and represents one homogenous, non-reproducible unit with unique specifications.

Batches are managed centrally as master data in an SAP ERP system. The SAP ERP system distributes batches to all connected SAP EWM systems through the Core Interface (CIF) or through an IDoc, depending on the SAP EWM release. You can also create and partially change batches in the SAP EWM system. Batch characteristics describe the technical, physical, and/or chemical properties of a batch, and are stored in the classification system.

> Note:
> In an SAP S/4HANA embedded EWM landscape, batches are not distributed and the batches do not exist additionally in EWM as described above. The process in general does look the same, but the batch exists only once.
>
> In a decentral EWM system based on SAP S/4HANA, changes of batches are not supported in the same way as in a SCM based EWM. Please see the SAP Note “2808143 - Overview: Batch management for decentralized EWM SAP S/4Hana” for details about the limitations and supported processes.



Material T-EW10-00
Batch L001R
Plant SPCW
Storage Location AFOO

Classification of Batch
Class EWM
Class Type 023
Values for Class EWM – Object T-EW10-00 L001R

Characteristics Description
Expiration date, shelf life
Date When Batch Was Produced
EWM Color
Status of Batch

Figure 60: Batch in ERP

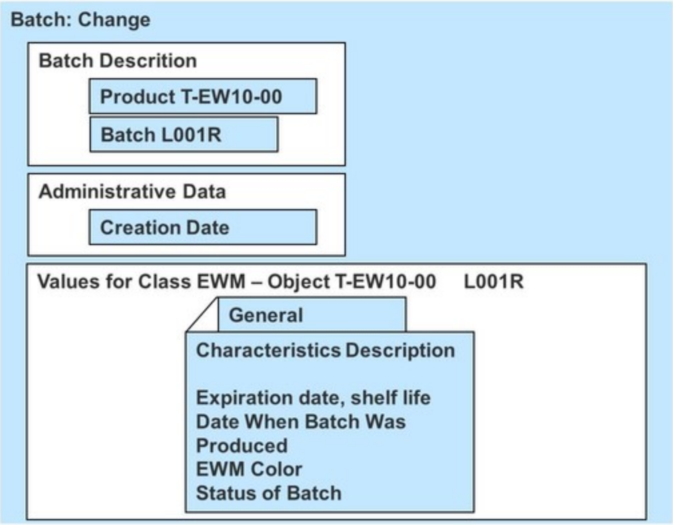
Batches in EWM

Batch master data is also available in the SAP EWM system, but looks different depending on the SAP EWM system.

In an SAP S/4HANA based decentral EWM system you have the same transactions as in an ERP system, but you can only display the batch, not create or change it with these transaction. For details see the note described in the previous section.

In a SCM based decentral EWM system, you have a separate transaction for the display, maintenance, or creation of a batch. From the SAP EWM *Index* screen, choose *Extended Warehouse Management* → *Master Data* → *Product* → *Maintain Batches for Product* .

As described in the previous section, in an SAP S/4HANA embedded EWM, no separate batch exist in EWM.



Batch: Change

Batch Descrition

Product T-EW10-00

Batch L001R

Administrative Data

Creation Date

Values for Class EWM – Object T-EW10-00 L001R

General

Characteristics Description

Expiration date, shelf life
Date When Batch Was Produced
EWM Color
Status of Batch

Figure 61: Batch in EWM (SCM based)

Batch Level

The batch level, that is, the level on which the batch is uniquely identifiable, can be set in ERP on different levels.

- Plant level:

  The batch number is unique in connection with the plant and material.

- Material level:

  The batch number is unique in all plants associated with the material.

- Client level:

  The batch number is unique in the entire client. A batch number can only be assigned once in the client. You cannot assign the same batch number for different materials.

Up to SAP EWM 9.3, only the Material level and Client level were supported for batches. Since release 9.4, SAP EWM also supports the Plant level for batches.

Batches in Inbound Processes

When you receive material that is batch relevant, a batch must be created before the goods receipt can be posted (as the batch is part of the stock information). The batch creation can happen at various times.

The batch can be created before you create the inbound delivery in ERP and directly entered in that inbound delivery. You can also create a batch in ERP during the creation of the ERP inbound delivery (customizing must be set up accordingly). With an active CIF model, the batch data is immediately distributed and the batch information of the ERP inbound delivery is also available in the SAP EWM inbound delivery. For an SAP S/4HANA based decentral EWM the distribution is done via evaluation of change pointers and through an IDoc. The main difference is that the distribution does not automatically follow immediately after the creation of the batch in ERP, but depends on the scheduling of the background job.

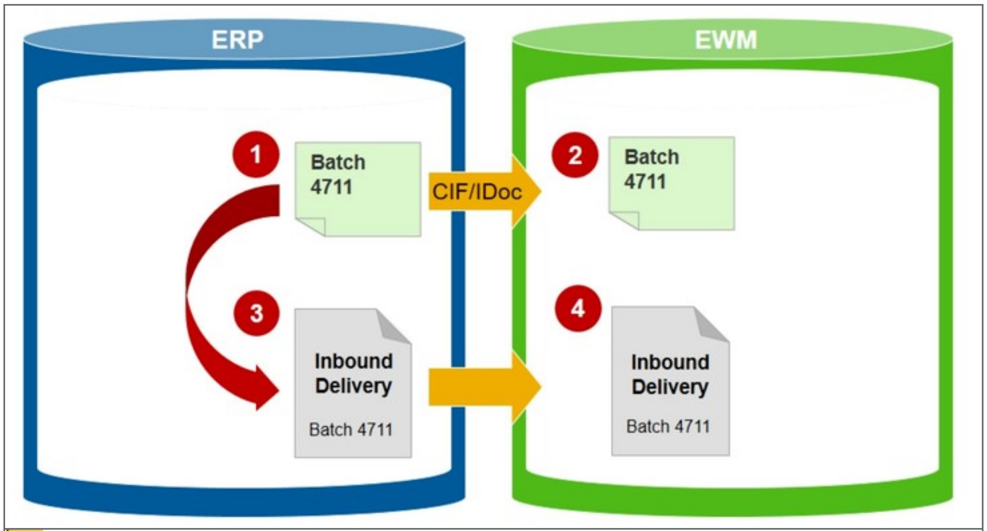


Figure 62: Batch Creation in ERP

Batch Creation in EWM Inbound Delivery

The batch can also be created in SAP EWM. In that case, it is automatically created in the background in ERP using a remote function call.

In a SCM based EWM the transaction */SCWM/WM_BATCH_MAINT* can be used to create, change, and display batches. This transaction is not available in an SAP S/4HANA based EWM.

The batch can also be created in SAP EWM in the inbound delivery itself. This is possible in SCM as well as in SAP S/4HANA based EWM. In this case, in the standard only certain characteristics like the production and the shelf life expiration date can be directly maintained. Other characteristics must be maintained in the batch master record. This can of course be done in ERP. In a SCWM based EWM it can be done with the transaction */SCWM/WM_BATCH_MAINT*. Batch characteristics can also be changed during quality inspection in SAP EWM, independent if it is SCM or SAP S/4HANA based.

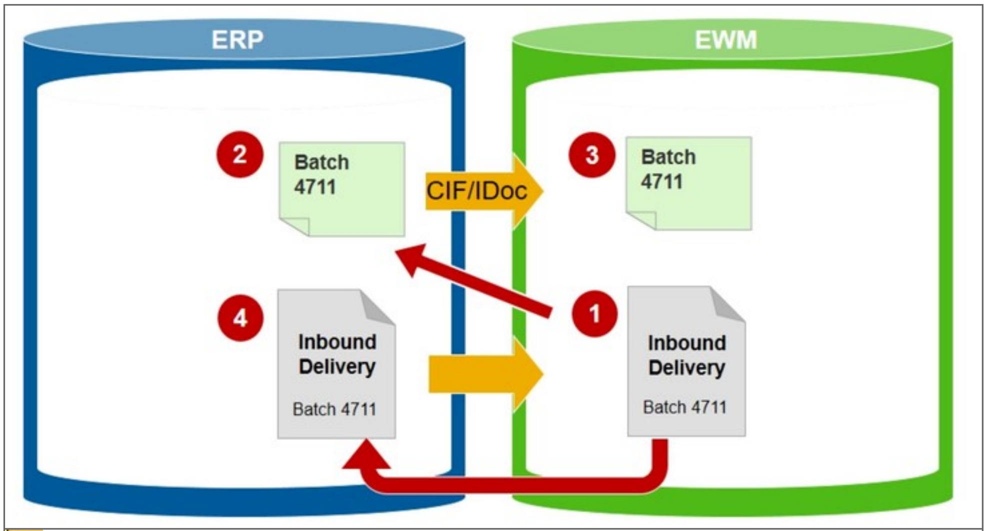


Figure 63: Batch Creation in EWM

Batches in Outbound Processes

You can assign batches to be sold or picked manually at certain points, but it can be done automatically using batch determination, which uses condition technique. This enables you to define your own search strategies by choosing the relevant key fields from the business transaction to search for batches. For example, you choose the combination of customer and material and then specify the criteria for batch selection.

Batch Determination in Sales Orders

The batch can be determined automatically in the sales order. This batch is then copied into the ERP outbound delivery and the SAP EWM outbound delivery order and picking is limited to quants that are part of this batch. However, in a sales order, batch splits are not possible. This means that the system assigns one batch only. If this batch does not have the required quantity, the rest of the sales order is never fulfilled.

Batch Determination in Deliveries

During a batch determination in a delivery, the system always creates a batch split. The system can select as many batches as are required to fulfill the requested quantity, as long as the batch determination criteria are fulfilled. In the case where not enough stock is available in the right batches, the sales order is still open and can be fulfilled later when new batches with the required criteria are available.

Batch Determination with SAP EWM

From a warehouse point-of-view, a batch assigned in the ERP outbound delivery may not be the best choice, because the sort criteria for the batch determination do not reflect any picking strategies. SAP EWM does not have batch determination functionality. However, the interface can be set up so that ERP batch determination in the outbound delivery is only being used to determine the batch determination criteria that needs to be fulfilled, without assigning a batch. These criteria are then passed on to SAP EWM and used to determine the best quant from a warehouse picking strategy, while fulfilling the batch determination requirement.

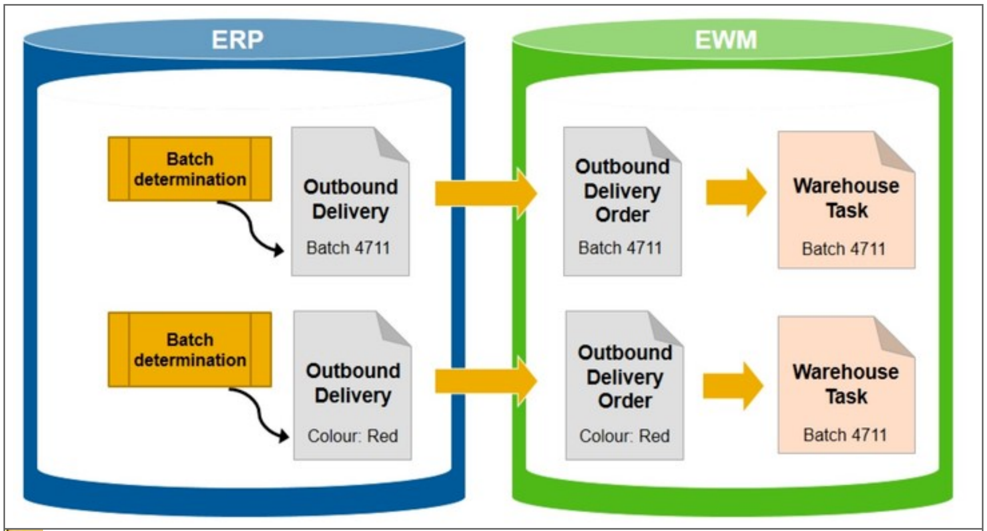


Figure 64: Batch Determination Outbound

LESSON SUMMARY

You should now be able to:

- Create batches in inbound processes
- Select batches in outbound processes

Unit 4
Lesson 4

Mapping Quality Inspection Processes

LESSON OVERVIEW

In this lesson, you learn how EWM uses the Quality Inspection Engine (QIE) to provide a quality inspection process. We look at the concepts and functions that are provided by QIE.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Control the goods with the Quality Inspection Engine
- Connect the quality inspection engine and SAP ERP QM

Quality Management

When you receive goods into your warehouse, examine the products to confirm that the vendor has sent the correct quantity and quality.

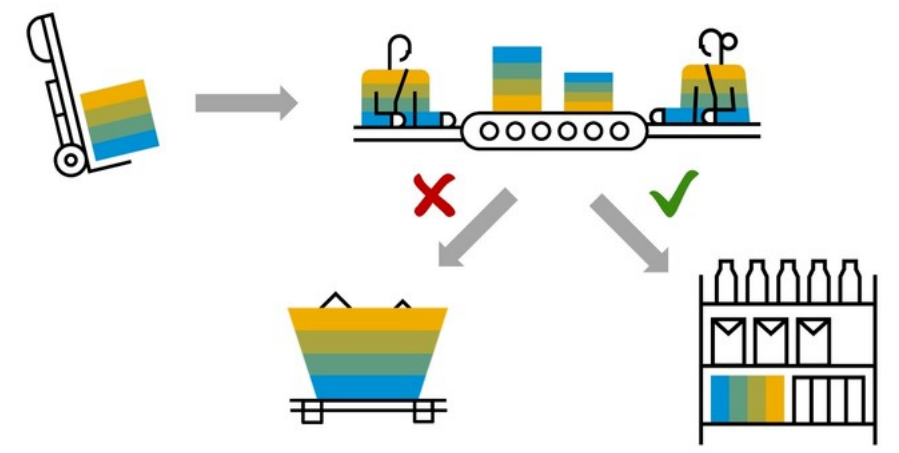


Figure 65: Quality Management

Depending on the inspection result, you may putaway the products, return them to the vendor, scrap them, or initiate a follow up inspection. Quality Inspection in decentral EWM is enabled by the Quality Inspection Engine (QIE). The QIE provides services to trigger the following tasks:

- Inspection
- Creation of samples and calculation of sample size
- Printing of work papers
- Recording inspection results

- Decision about quality and quality-control levels

QIE Architecture

In the QIE architecture, a QIE consumer refers to an application that uses QIE functionality. The QIE consumer is generally an independent system that is linked to QIE through a qRFC and/or XI interface. Alternatively, it can be a part of the consumer system, such as SAP EWM.

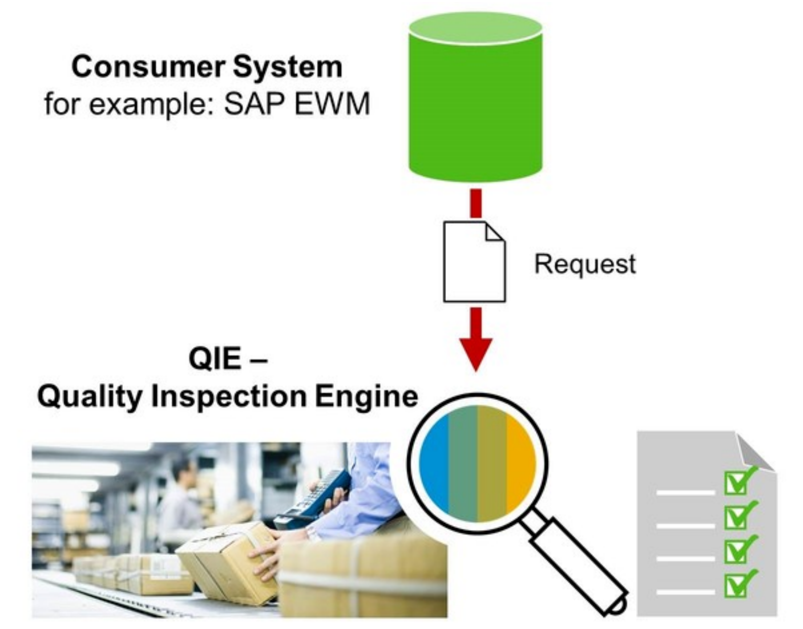


Figure 66: Quality Management with the Quality Inspection Engine

QIE is independent of the ERP system. It can be connected to an external ERP system for a complete quality management (QM) process, as shown in the figure, Quality Inspections Using an External QM System.

The development platform for QIE is the Web Application Server (WAS). QIE is an engine that is technically designed as an Add-On. SAP EWM is the first consumer system and it uses QIE as a required Add-On.

> Note:
> SAP S/4HANA embedded EWM does not use the QIE for quality inspections, but uses QM directly. Therefore, not all inspection objects types described in this section are available in SAP S/4HANA embedded EWM.

Inbound Processes with Quality Inspection in SAP EWM

Quality checks can be performed at different stages, for example:

- When the transportation unit is unloaded: Check the pallet and move it to a work place for unpacking.
- When the pallet is routed to an inspection area: Check the quality of the pallet and then putaway to the final storage bin or return it to the vendor (depending on the quality).

- In set intervals for products where are being kept in the warehouse.

The inspections that are done are controlled by the inspection object type. The inspection object type defines in which software component, in which process, and for which object the inspection documents can be created in the QIE. The inspection object types for SAP EWM exist by default. In customizing, they are activated for each warehouse number. Once activated, inspections are possible.

Inspection Object Types

- Preliminary Inspection Inbound Delivery (1)
- Preliminary Inspection Handling Unit (2)
- Counting Inbound Delivery (2)
- Q-Inspection Returns Delivery
- Q-Inspection Product/Batch Inbound Delivery
- Q-Inspection Product/Batch Warehouse-Internal

(1) this inspection object type is only available in SCM based EWM up to SAP EWM 9.5.

(2) these inspection object types are only available in a decentral EWM, but not in embedded EWM.

Another requirement for inspections is an inspection rule. An inspection rule describes an inspection in further detail, for example:

- What shall be inspected, for example, a material, a delivery type, or deliveries from a specific vendor?
- How shall the inspection be performed, for example, on a sample or with 100% inspection?

In embedded EWM, it is not necessary anymore to use inspection rules.

Quality Inspection with SAP ERP QM

If you require a more complex quality management process, the QIE can be connected to an external QM system, such as SAP ERP QM. Here, you can cover detailed analytical inspections with characteristics.

Within the activation of an inspection document in SAP EWM, the QIE triggers the creation of an inspection lot in ERP QM. The inspection process is executed in the external system, which is the ERP QM system. ERP QM sends back the usage decision to the QIE after the inspection is done.

> Note:
> Because SAP S/4HANA embedded EWM does not use the Quality Inspection Engine, the communication is different. Messages are sent directly between EWM and QM in this instance.

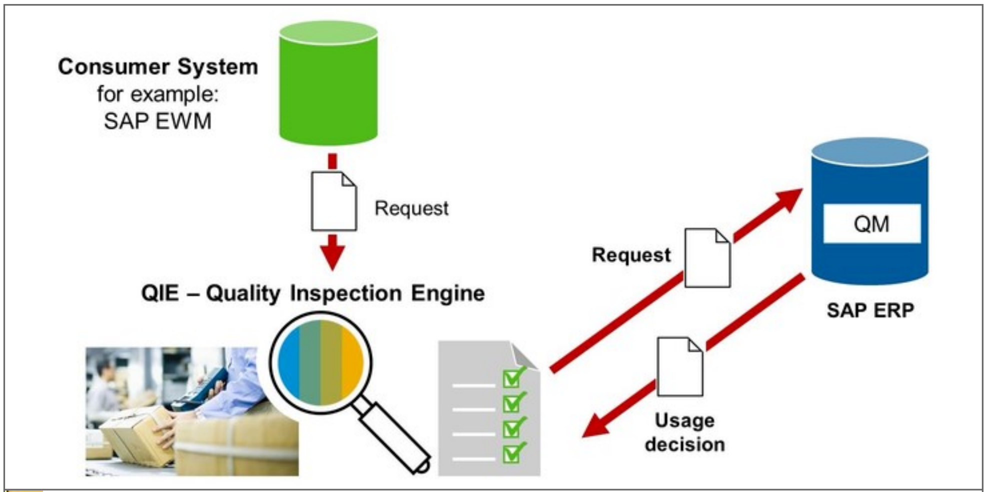


Figure 67: Quality Inspections using an External QM System

LESSON SUMMARY

You should now be able to:

- Control the goods with the Quality Inspection Engine
- Connect the quality inspection engine and SAP ERP QM

Unit 4
Lesson 5

Applying Value-Added Services

LESSON OVERVIEW

This lesson describes the use of value-added services. We look at the characteristics of value-added services, and you learn how to execute them. You also learn how to execute a kit-to-order process.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Execute value-added services
- Execute a kit-to-order process

Value-Added Services

Examples of value-added services (VAS) include the following tasks:

- Assembling products
- Packing products
- Labeling products
- Oiling products

You can use process-oriented storage control to execute interim steps before final putaway or before staging in the goods issue area. In these interim steps, the VAS order defines the product processing that must be performed; for example, by warehouse employees in the work centers.

A VAS order can also be used in the goods issue process to assemble kits for your customers and to pack them on a customer-specific basis.

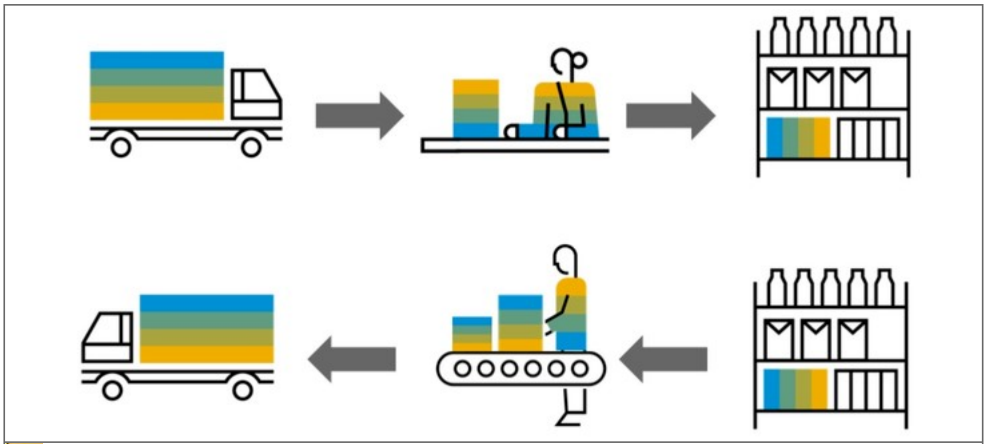


Figure 68: Value-Added Services

Purposes of a VAS Order

The VAS order is the central SAP EWM document that controls the VAS process.

From a technical point-of-view, the VAS order is a packaging specification with a specific characteristic value.

The VAS order is the instruction to perform a value-added service on one or more products with reference to a delivery item. A VAS order links delivery items to a packing instruction and it contains details from the delivery and packaging specification. You can use a VAS order to:

- Inform warehouse employees about the tasks they must perform on certain products
- Track work that is performed

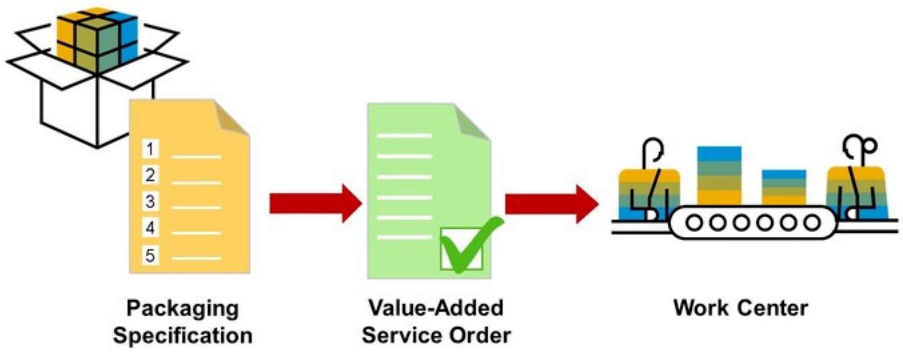


Figure 69: Value-Added Service Order

VAS Order Details

A VAS order is created with reference to an inbound delivery or an outbound delivery order and the required packaging specification. The packaging specification uses packaging specification levels to inform the VAS order regarding VAS activities the warehouse employees need to perform in the warehouse. Information in the delivery provides the VAS order with the exact amount of work to be performed.

The VAS order contains the following:

- Order header
- List of VAS activities
- Items
- Auxiliary products

A VAS order can be created manually or automatically. Automatic VAS order generation can be configured to create the VAS order in the following situations:

- When the warehouse request document is created
- For an inbound process, when the goods receipt posting is made

VAS Data

The VAS data from the VAS order can be viewed or printed for employees in a VAS work center. VAS data can also be viewed in the warehouse management monitor.

You can record the auxiliary products and the quantities used for the value-added services performed at work centers. Examples of auxiliary products used in VAS processing are products such as packaging materials, strapping, shrink wrap, hangers, labels, and miscellaneous supplies.

Consumption can be recorded for all auxiliary products in the system if:

- Consumption has been set for auxiliary products required for value-added services
- A storage bin has been assigned in the VAS work center for the auxiliary products

Options in a Putaway or Picking Process with Value-Added Service

Depending on how you use storage control, there are different options available in the goods receipt process or the goods issue process for performing value-added services using a VAS order.

Value-Added Services with Process-Oriented Storage Control

If you are using process-oriented storage control, the system uses handling unit warehouse tasks for the movements in the warehouse. It requires that you work with HUs, but additional process steps are possible before or after the VAS activity (like unloading / loading).

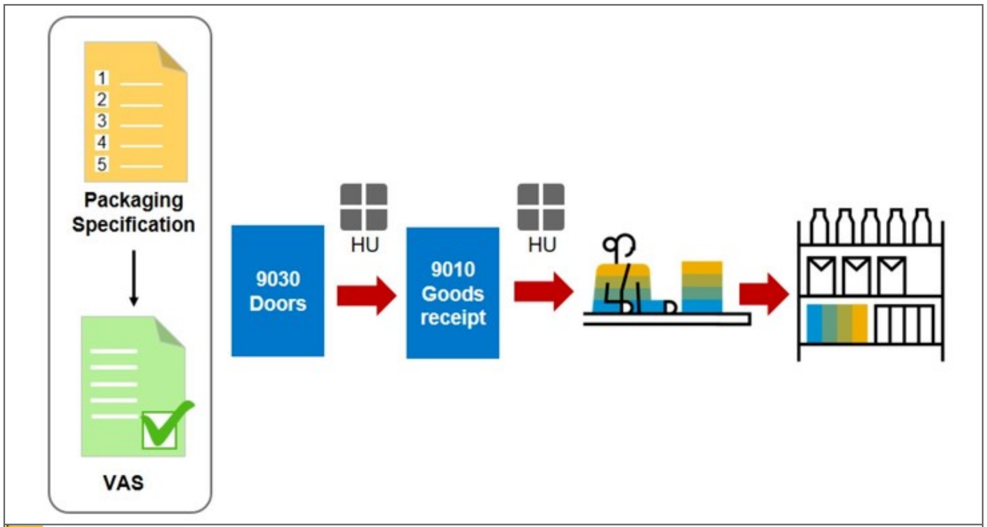


Figure 70: Value-Added Service with Process-Oriented Storage Control

Value-Added Service with Process Step

If you have only defined the individual process steps, and are not using process-oriented storage control, physical movements are done with products warehouse tasks. HUs are not required, but therefore of course no other process steps are possible. It is possible to have more then one work center for value added service steps, but the creation of the warehouse task has to be triggered from the work center. For this you do not complete the process step assigned the HU, but use the function *Create VAS Warehouse Task* .

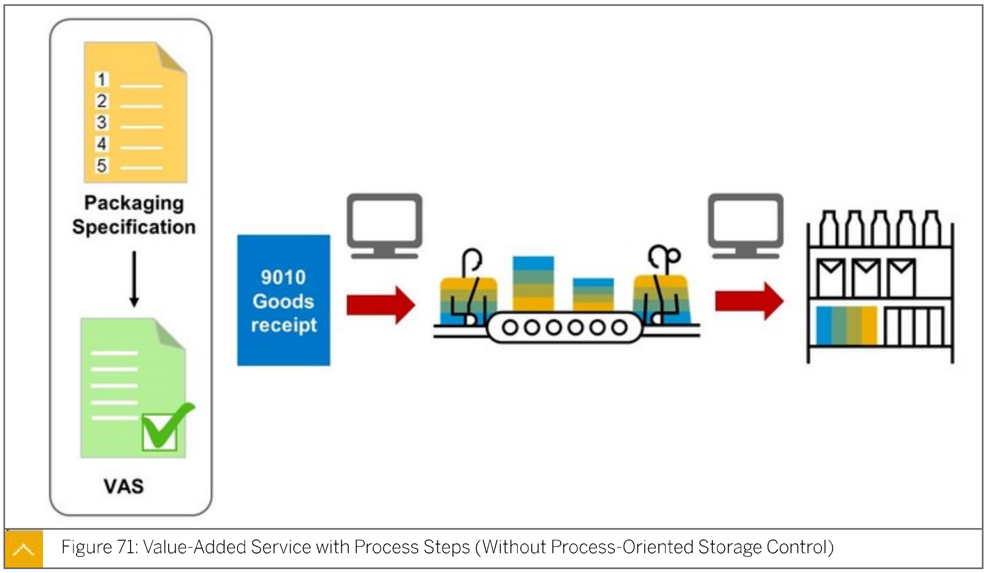


Figure 71: Value-Added Service with Process Steps (Without Process-Oriented Storage Control)

Value-Added Service Without Process

If you are not using process-oriented storage control, and you have not defined any process steps, you print out the VAS order and the warehouse employees undertake the VAS activities at the work centers manually. When the VAS activities are completed, you can enter a confirmation in the system, but this is independent of the movement with warehouse tasks.

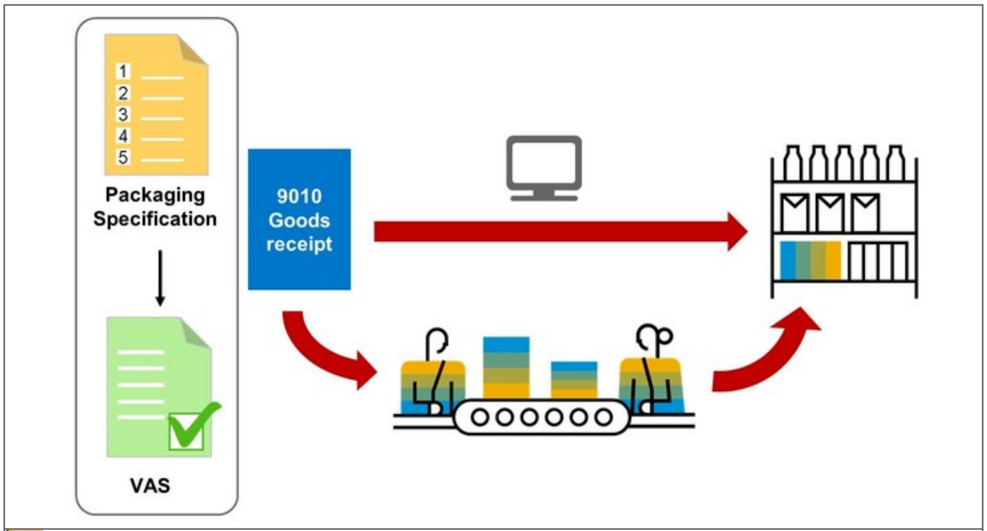


Figure 72: Value-Added Service Without Process

Kits and Kitting

A kit is a list of products that are always delivered together. Examples of kits include the following entities:

- Groups of materials used to repair a piece of machinery
- Groups of materials used for assembly tasks
- Add-on products for other products
- Displays or assortments of products to sell in a retail store

SAP Extended Warehouse Management does not save kits as master data. Instead, it receives information about the structure of a kit in the form of outbound delivery items from the SAP ERP system. The structure containing the kit in the outbound delivery along with a packaging specification, is used as a basis for assembling or producing a kit in SAP EWM.

A kit can consist of the following levels:

- Kit header, which represents the finished kit
- Kit component, which represents a product in the kit

SAP EWM does not support "nested kits" (which are kits within kits).

"Kitting" is the process of building or assembling kits. SAP EWM supports kit-to-order and kit-to-stock processes.

In the kit-to-order process, each kit is assembled based on a customer order. This is similar to a make-to-order manufacturing process. To support sales of pre-assembled kits, SAP EWM also provides a kit-to-stock process in which kits are pre-assembled and placed into stock.

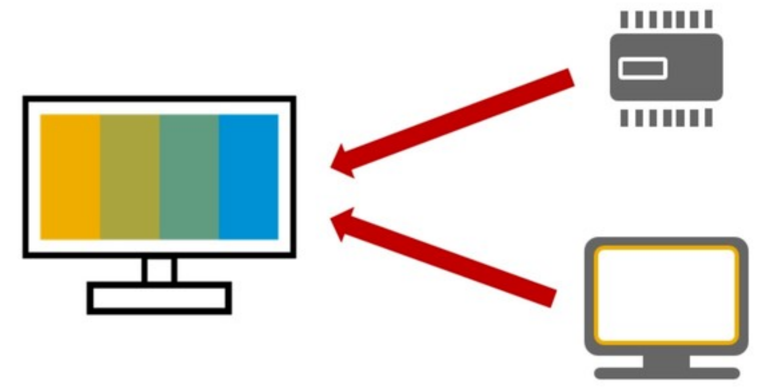


Figure 73: Kit Header and Kit Components

Kitting Process

Although SAP EWM supports the kitting processes, there is no master data such as a bill-of-material (BOM) stored in SAP EWM. The kit is represented as a hierarchy of items of an outbound delivery order. In kit-to-stock, SAP EWM can reference a BOM stored in the ERP system.

The kit-to-order process requires either the use of SAP CRM, Release 5.0 (or higher) or ECC 6.0 Sales and Distribution.

The following rules apply to kits:

- A kit is always delivered in full to a customer.
- The kit header and kit components are always scheduled for the same date.
- All components for the kit must come from the same warehouse.
- Kit prices are always calculated at the header level.
- A kit header and the kit components have a quantity ratio to each other. This is defined by the kit structure.

Kit-to-Order Process Steps

The kit-to-order process, in its simplest form, consists of the following steps:

1. A sales order is created for the kit header in SAP CRM or in SAP ERP.
2. SAP EWM creates a warehouse request (outbound delivery order). This process triggers the kit-to-order process.
3. The kit components are picked and assembled into the finished kits.
4. The system confirms the delivery and the goods issue is posted for the kits.
5. The sales order is updated and the billing is triggered for the order.

Kit-to-order processing can be performed using a VAS Order and a corresponding work center, or it can be performed as part of the picking process.

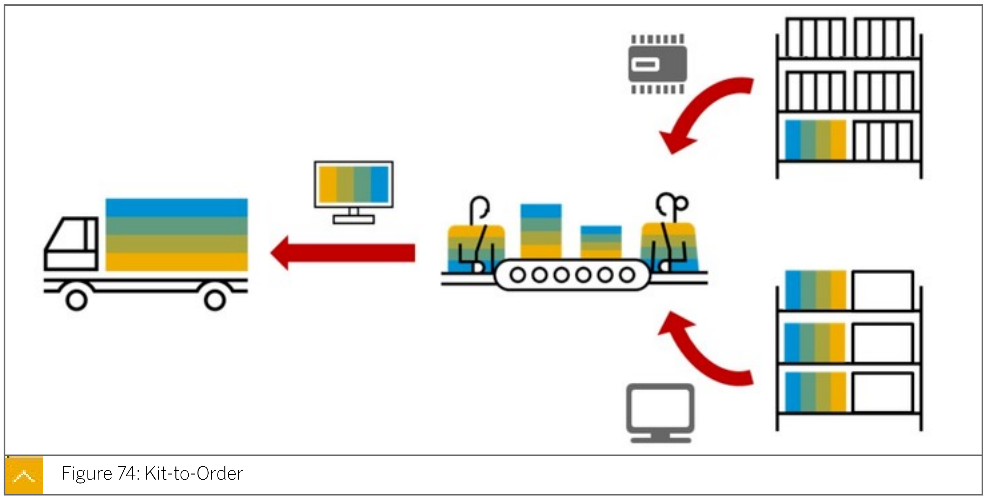


Figure 74: Kit-to-Order

Kit-to-Stock Process

The process of creating kits and then transferring them to stock is executed and documented in the warehouse. You can either trigger kit creation manually in the ERP system based on a production order or in the SAP EWM system directly, using a VAS order.

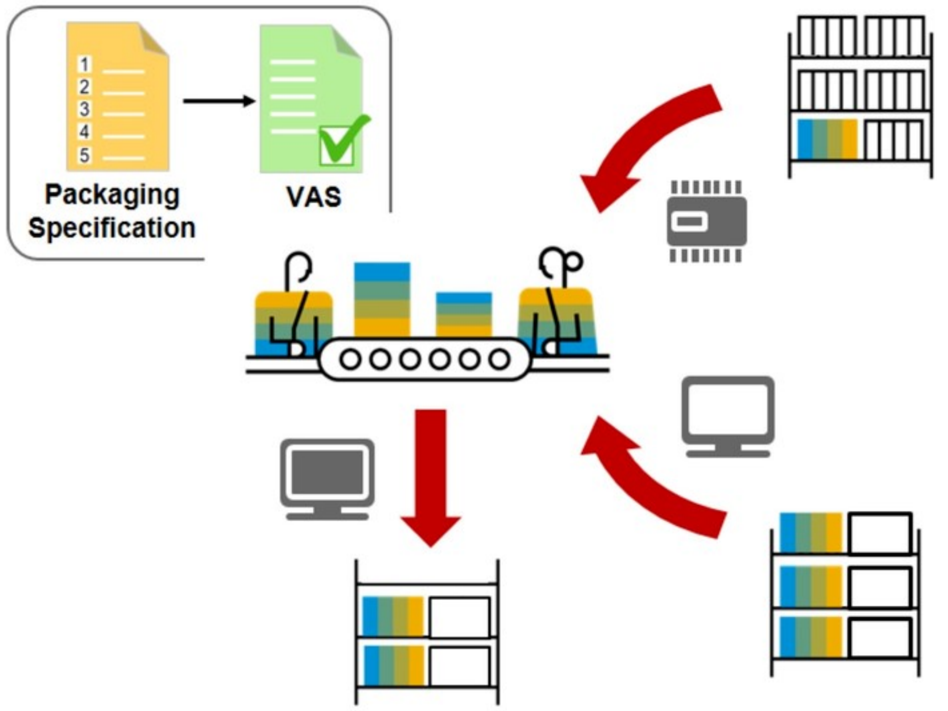


Figure 75: Kit-to-Stock

You can also perform reverse kitting, which splits a kit back into its components.

LESSON SUMMARY

You should now be able to:

- Execute value-added services
- Execute a kit-to-order process

Unit 4

Learning Assessment

1. Layout-oriented storage control is normally used when stock movements in the warehouse do not travel directly from a source storage bin to a destination location. Instead, they travel through an intermediate storage bin or many intermediate storage bins. What is/are the exceptions(s)?

   Choose the correct answers.

   ☐ A When pick points are used.

   ☐ B When you want to pack the material at a work center.

   ☐ C When you want to switch resources.

   ☐ D When you want to apply a value added service.

2. Do you require a handling unit for the process-oriented storage control?

   Choose the correct answer.

   ☐ A No, HUs are not required

   ☐ B Yes, HUs are necessary

3. What is a consolidated handling unit (HU)?

   Choose the correct answer.

   ☐ A A consolidated handling unit is created when you pack multiple HUs into another HU.

   ☐ B A consolidated handling unit is a grouping of products with correct dimensions and weight to fit on a HU

4. A serial number profile is a four-character code that determines the conditions and business transactions for issuing serial numbers to serialized products. Where is the serial number profile created?

   Choose the correct answer.

   ☐ A Master Data

   ☐ B Customizing

5. When posting a goods receipt, you can create a provisional serial number and use this for putaway.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

6. Where can a batch be created?

   Choose the correct answer.

   ☐ A Batches can only be created in ERP

   ☐ B Batches can only be created in SAP EWM

   ☐ C Batches can be created in ERP and SAP EWM

7. Is the following statement true: Batches have to be determined in the sales order so that the information is properly passed over to SAP EWM.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

8. The Quality Inspection Engine (QIE) provides services to trigger inspection, decisions about quality and quality control levels, and:

   Choose the correct answers.

   ☐ A Creation of samples and calculation of sample size

   ☐ B Printing of work papers

   ☐ C Assigning warehouse staff to quality

   ☐ D Recording of inspection results

9. When an inspection document is activated in SAP EWM, the QIE triggers the creation of an inspection lot in ERP QM. In which one of the following systems is the inspection process then executed?

   Choose the correct answer.

   ☐ A The EWM QM system

   ☐ B The ERP QM system

   ☐ C The external QIE system

10. A VAS order is created with reference to:

    Choose the correct answers.

    ☐ A An outbound delivery order

    ☐ B The required packaging specification

    ☐ C A manufacturing request

    ☐ D A picking list

11. For a kit-to-order process you need a sales bill of material.

    Determine whether this statement is true or false.

    ☐ True

    ☐ False

12. Put the steps of the kit-to-order process into the correct sequence.

    Arrange these steps into the correct sequence.

    ☐ A warehouse employee finalizes the delivery and the goods issue is posted for the kits.

    ☐ The ERP outbound delivery is updated and the billing is triggered for the order.

    ☐ The kit components are picked and assembled into the finished kits.

    ☐ A sales order is created for the kit product in SAP CRM or in SAP ERP and the outbound delivery is created.

    ☐ SAP EWM creates a warehouse request (outbound delivery order) for the outbound delivery request.

Unit 4

Learning Assessment - Answers

1. Layout-oriented storage control is normally used when stock movements in the warehouse do not travel directly from a source storage bin to a destination location. Instead, they travel through an intermediate storage bin or many intermediate storage bins. What is/are the exceptions(s)?

   Choose the correct answers.

   ☐ A When pick points are used.

   ☒ B When you want to pack the material at a work center.

   ☐ C When you want to switch resources.

   ☒ D When you want to apply a value added service.

   Correct. Layout-oriented storage control is normally used when stock movements in the warehouse do not travel directly from a source storage bin to a destination location. The two exceptions to this case are when you want to pack the material at a work center or when you want to apply a value added service.

2. Do you require a handling unit for the process-oriented storage control?

   Choose the correct answer.

   ☐ A No, HUs are not required

   ☒ B Yes, HUs are necessary

3. What is a consolidated handling unit (HU)?

   Choose the correct answer.

   ☒ A A consolidated handling unit is created when you pack multiple HUs into another HU.

   ☐ B A consolidated handling unit is a grouping of products with correct dimensions and weight to fit on a HU

   Correct, a consolidated handling unit is created when you pack multiple HUs into another HU.

4. A serial number profile is a four-character code that determines the conditions and business transactions for issuing serial numbers to serialized products. Where is the serial number profile created?

   Choose the correct answer.

   ☐ A Master Data

   ☒ B Customizing

5. When posting a goods receipt, you can create a provisional serial number and use this for putaway.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

   Correct. When posting a goods receipt, you can create a provisional serial number and use this for putaway.

6. Where can a batch be created?

   Choose the correct answer.

   ☐ A Batches can only be created in ERP

   ☐ B Batches can only be created in SAP EWM

   ☒ C Batches can be created in ERP and SAP EWM

7. Is the following statement true: Batches have to be determined in the sales order so that the information is properly passed over to SAP EWM.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False

8. The Quality Inspection Engine (QIE) provides services to trigger inspection, decisions about quality and quality control levels, and:

   Choose the correct answers.

   ☒ A Creation of samples and calculation of sample size

   ☒ B Printing of work papers

   ☐ C Assigning warehouse staff to quality

   ☒ D Recording of inspection results

   Correct. The Quality Inspection Engine (QIE) provides services to trigger inspection, decisions about quality and quality control levels, creation of samples and calculation of sample size, printing of work papers, and recording of inspection results.

9. When an inspection document is activated in SAP EWM, the QIE triggers the creation of an inspection lot in ERP QM. In which one of the following systems is the inspection process then executed?

   Choose the correct answer.

   ☐ A The EWM QM system

   ☒ B The ERP QM system

   ☐ C The external QIE system

10. A VAS order is created with reference to:

    Choose the correct answers.

    ☒ A An outbound delivery order

    ☒ B The required packaging specification

    ☐ C A manufacturing request

    ☐ D A picking list

    Correct. A VAS order is created with reference to an outbound delivery order and the required packaging specification.

11. For a kit-to-order process you need a sales bill of material.

    Determine whether this statement is true or false.

    ☒ True

    ☐ False

12. Put the steps of the kit-to-order process into the correct sequence.

Arrange these steps into the correct sequence.

4 A warehouse employee finalizes the delivery and the goods issue is posted for the kits.

5 The ERP outbound delivery is updated and the billing is triggered for the order.

3 The kit components are picked and assembled into the finished kits.

1 A sales order is created for the kit product in SAP CRM or in SAP ERP and the outbound delivery is created.

2 SAP EWM creates a warehouse request (outbound delivery order) for the outbound delivery request.

UNIT 5

Warehouse Organization

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UNIT OBJECTIVES

- Perform the slotting process
- Apply replenishment methods
- Perform a physical inventory

Unit 5
Lesson 1

Performing Slotting

LESSON OVERVIEW

In this lesson, we look at the goals and process of slotting. At the end of this lesson, you will know how to perform slotting to determine the best storage bin for a material.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Perform the slotting process

Slotting

The goal of slotting is to determine the best storage bin for a material. The best bin for a material depends on factors such as whether that material is fast-moving, slow-moving, and so on. A well laid-out warehouse makes the picking process easier.

Slotting determines the ideal putaway parameters such as storage type, storage section, and bin type for a product in a particular warehouse. This information (sections, storage types, bins, and so on) is stored in the warehouse product and can be activated at any time.

Examples of data that the slotting process uses to determine putaway, includes:

- Product data
- Storage requirement data
- Packaging data
- Demand forecasts

As a prerequisite, you must define requirement or dimension indicators in SAP EWM customizing, and assign them correspondent intervals. Using Condition Technique , you define the values that make a correspondent setting conditional, for example:

1. Putaway control indicator (and, optionally, stock removal control indicator)
2. Maximum quantity in storage type
3. Storage section indicator
4. Storage bin types

During slotting, the system determines the storage parameters and stores them in the warehouse product. They are stored either as planned values (for the future) or you can update the warehouse product immediately.

Product Related Data

The following is an example of product-related data that can be used as input for slotting.

Table 2: Product Related Data Used for Slotting

Field	Value
Storage condition	3 (not outside)
Rotate indicator	Y
Theft-prone	N
Handling code	200 (metal)
Demand quantity	700 (per month)
Number of order lines	50
Recommended storage quantity	2100
Storage class	13 (Non-inflammable solids)
Water pollution classification	1 (Minimal water pollution danger)
Nesting factors	0.5
Package type	Default packaging material (Wooden pallets)
Material length	0.05m
Material width	0.01m
Material height	0.01m
Material weight	10g
Packaging length	0.80m
Packaging width	1.0m
Packaging height	1.0m
Packaging weight	75kg

Calculate Parameters

To calculate parameters, such as the maximum quantity in the storage type, slotting needs product-requirement data or the forecasted demand for the relevant product.

Demand and data is useful when slotting is used to relocate products based on whether they are fast-moving or slow-moving.

This requirement or demand data can come from SAP Advanced Planning and Optimization (APO), you can enter the data manually, or you can enter the data by mass maintenance. SAP Extended Warehouse Management (EWM) stores this information locally in the warehouse product (on the *Slotting* tab in the *Requirement/Demand Data* area).

When using SAP APO planning data, it is important to realize that SAP APO and SAP EWM manage requirements data at different organizational levels. SAP APO performs planning processes for locations of the type Plant. SAP EWM stores requirement data at the warehouse number level. Slotting assumes that a one-to-one relationship exists between the SAP APO location and the SAP EWM warehouse number. If the relationship is not one-to-one, you can use Business Add-Ins (BAdIs) for the conversion.

Slotting Process

The overall slotting process is shown in the following figure.

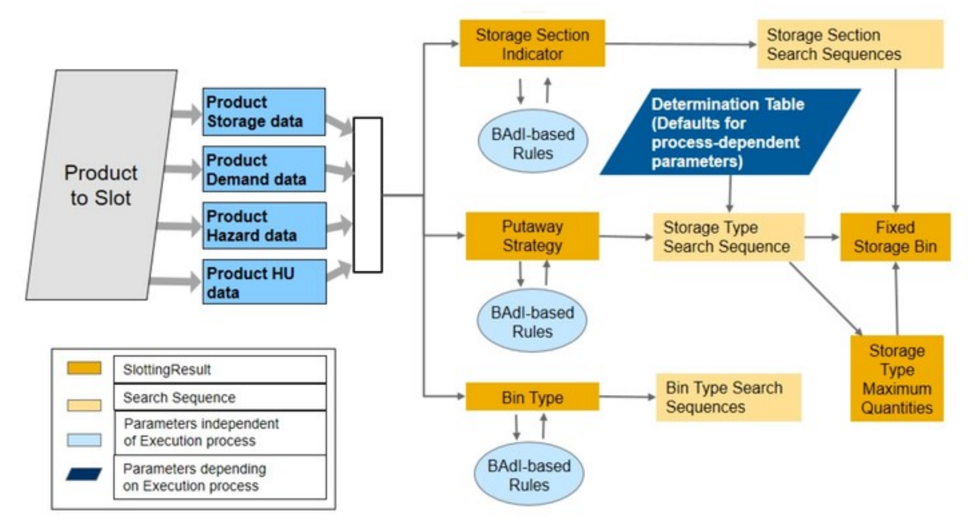

Product to Slot
Product Storage data
Product Demand data
Product Hazard data
Product HU data
Storage Section Indicator
Storage Section Search Sequences
BAdI-based Rules
Determination Table (Defaults for process-dependent parameters)
Putaway Strategy
Storage Type Search Sequence
Fixed Storage Bin
BAdI-based Rules
Storage Type Maximum Quantities
Bin Type
Bin Type Search Sequences
BAdI-based Rules
SlottingResult
Search Sequence
Parameters independent of Execution process
Parameters depending on Execution process

Figure 76: Slotting Process

Updating Product Master Data for Slotting

Whether the product master data is updated or not, and if the values are adjusted as active values or planned values, depends on the save mode that you use when slotting. Three options are offered as follows:

- Do not save results
- Save results
- Save and activate results

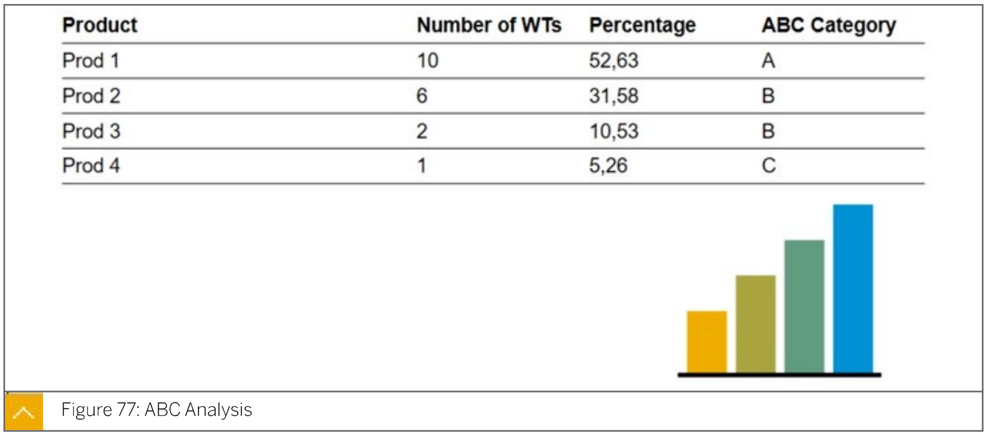
Do not save results:You should use this option if you have performed slotting interactively and you want to analyze the results. (If you have performed slotting in the background, you can analyze the log, but you cannot see the results directly.)

Save results:Depending on the storage bin and stock situation, it can be useful to save the results of slotting as planned values only. The system only keeps the planned values for possible activation, and does not use them in storage processes. (The system only updates the planned values in the warehouse product.)

Save and activate results:The system updates the results of slotting in the fields for the planned values and the active values in the warehouse product. These new values are then available immediately for all storage processes. (The system updates both the planned values and the active values in the warehouse product).

ABC Analysis

ABC analysis in SAP Extended Warehouse Management (EWM) allows you to categorize the importance of products based on confirmed warehouse tasks.



Product	Number of WTs	Percentage	ABC Category
Prod 1	10	52,63	A
Prod 2	6	31,58	B
Prod 3	2	10,53	B
Prod 4	1	5,26	C

Figure 77: ABC Analysis

Note:
ABC analysis is meant for processes and warehouse operations that you can still oversee without using sophisticated BI techniques. It can be used in combination with slotting. In SAP EWM, the main functions for classification are available in slotting.

The advantage of the ABC analysis is that it does not required condition records and that it is based on historic data. Slotting reads demand data from APO Demand Planning, but therefore slotting can also use other information and update more indicators and parameters.

LESSON SUMMARY

You should now be able to:

- Perform the slotting process

Unit 5
Lesson 2

Applying Replenishment Methods

LESSON OVERVIEW

In this lesson, we look at the various replenishment methods and how they work. You learn how to choose and apply a replenishment method.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Apply replenishment methods

Replenishment

Many warehouses use a dedicated warehouse area as a primary picking area. Normally, one or more storage types are configured for "fixed-bin" picking as a stock removal strategy, but most replenishment techniques also work for other storage types.

Products stored in the picking area reduce over time and need to be replenished. Factors that influence the replenishment quantity include predefined stock levels and demand forecasts, for example.

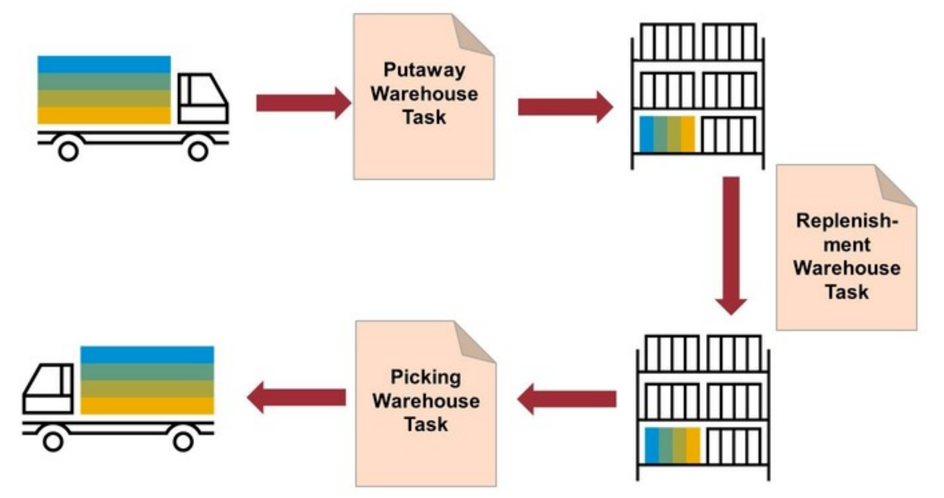


Figure 78: Replenishment Process

Replenishment Techniques

SAP EWM provides predefined techniques for the replenishment of storage bins. You can use any or all of these techniques in the warehouse to replenish storage bins. Before the replenishment control is used, certain data fields in the warehouse product must be updated. The data fields are as follows:

- Minimum Stocking Quantity
- Maximum Stocking Quantity
- Minimum Replenishment Quantity

The replenishment control fields can be specified at the storage type level in the warehouse product master or at the storage bin level. The data for the replenishment control fields can be entered manually or they can be determined using the slotting process.

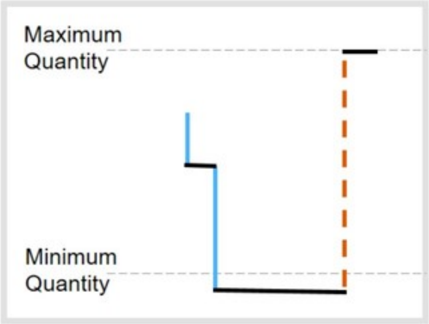
After the replenishment control data has been entered or determined, replenishment processing can begin. The replenishment control type is assigned to a storage type in Customizing. Some of the replenishment control types require additional settings in Customizing.

Planned Replenishment

You can start planned replenishment interactively or start it in the background.

The system calculates replenishment in accordance with the defined minimum quantity and maximum quantity. Replenishment control is triggered when the stock is less than the minimum quantity.

The system rounds down the replenishment quantity (the quantity of the warehouse task or warehouse request), to a multiple of the minimum replenishment quantity.



→ **Started in Online or Batch Mode**

→ **Calculates Replenishment according to Maximum and Minimum Quantity**

→ **Only Started when Stock figure is lower than the Minimum Quantity**

→ **Round down to Multiples of Minimum Replenishment Quantity**

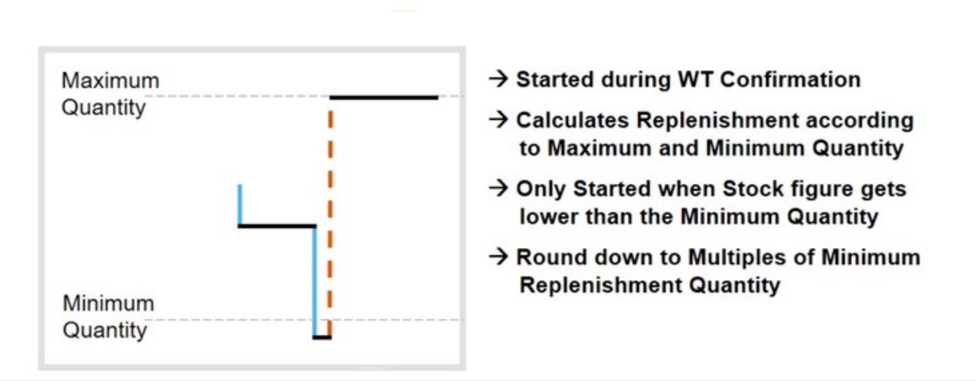
Figure 79: Planned Replenishment

Automatic Replenishment

The system starts automatic replenishment in the background when a warehouse task is confirmed.

The system calculates replenishment in accordance with the maximum and minimum quantity. Replenishment control is triggered when the stock is less than the minimum quantity.

The system rounds down the replenishment quantity to a multiple of the minimum replenishment quantity.



→ Started during WT Confirmation

→ Calculates Replenishment according to Maximum and Minimum Quantity

→ Only Started when Stock figure gets lower than the Minimum Quantity

→ Round down to Multiples of Minimum Replenishment Quantity

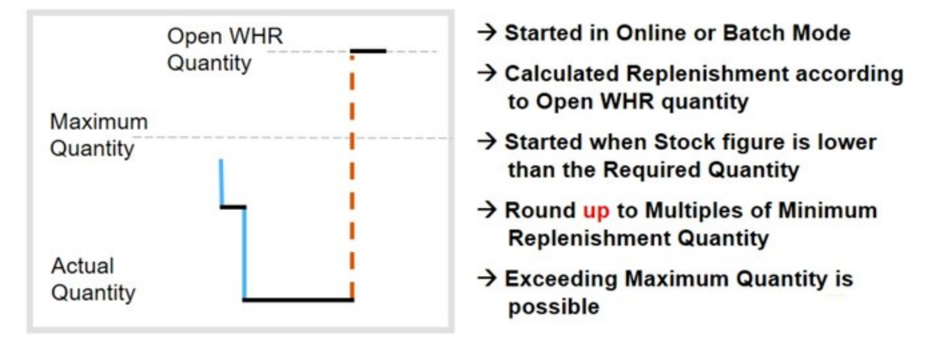
Figure 80: Automatic Replenishment

Order-Related Replenishment

You can start order-related replenishment interactively or start it in the background. The goal in order-related replenishment is to ensure that the selected outbound delivery orders can be fulfilled.

The system calculates the replenishment quantity in accordance with the quantity required on open warehouse requests. Replenishment control is triggered when the stock is less than the required quantity.

The system rounds up the replenishment quantity to a multiple of the minimum replenishment quantity. The maximum quantity can be exceeded with replenishment.



→ Started in Online or Batch Mode

→ Calculated Replenishment according to Open WHR quantity

→ Started when Stock figure is lower than the Required Quantity

→ Round up to Multiples of Minimum Replenishment Quantity

→ Exceeding Maximum Quantity is possible

Figure 81: Order-related Replenishment

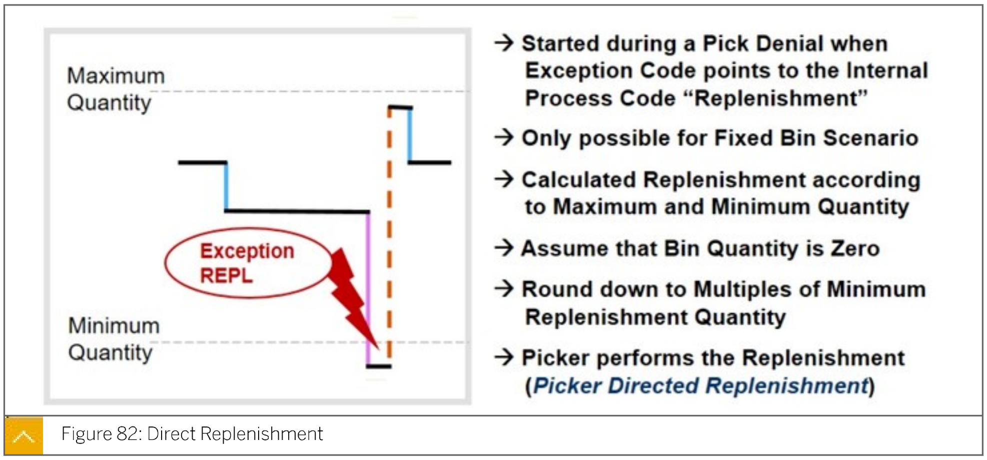
Direct Replenishment

Direct replenishment is started during a bin denial, that is, when an exception code refers to the internal process code "Replenishment".

Direct replenishment is only possible in fixed storage bin scenarios. The system calculates the replenishment in accordance with the maximum and minimum quantity. It assumes that the quantity at the storage bin is zero.

The system rounds down the replenishment quantity to a multiple of the minimum replenishment quantity.

Direct replenishment can be performed by the warehouse picker (picker-directed replenishment). In that case, a warehouse task for the replenishment displays as the next item to be processed in the picker's warehouse order. As a prerequisite, the system must have found stock in the permitted storage types. Picker-directed replenishment is only possible in radio frequency scenarios.



→ **Started during a Pick Denial when Exception Code points to the Internal Process Code "Replenishment"**

→ **Only possible for Fixed Bin Scenario**

→ **Calculated Replenishment according to Maximum and Minimum Quantity**

→ **Assume that Bin Quantity is Zero**

→ **Round down to Multiples of Minimum Replenishment Quantity**

→ **Picker performs the Replenishment (*Picker Directed Replenishment*)**

Figure 82: Direct Replenishment

LESSON SUMMARY

You should now be able to:

- Apply replenishment methods

Unit 5
Lesson 3

Performing a Physical Inventory

LESSON OVERVIEW

This lesson describes the physical inventory procedures. We look at the prerequisites for these procedures and the documents that go with them. At the end of this lesson, you will know how to perform a physical inventory.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Perform a physical inventory

Physical Inventory Procedures

To perform a physical inventory, you can choose between various inventory procedures such as:

- Continuous Physical Inventory Procedure
- Periodic Physical Inventory Procedure
- Cycle Counting

Figure 83: Physical Inventory

- Periodic Physical Inventory (Storage-Bin Specific and Product Specific)
- Continuous Physical Inventory Procedures
  - Ad-hoc Physical Inventory (Storage Bin Specific and Product Specific)
  - Putaway Physical Inventory
  - Low Stock/Zero Stock Physical Inventory
  - Low Stock/Zero Stock Check
  - Storage Bin Check
- Cycle Counting

Periodic Physical Inventory

SAP EWM supports an annual physical inventory (storage bin-specific and product-specific). In an annual physical inventory, you record all stocks on a certain day (or within a short time-period). This is usually done at the end of the fiscal year. During this time, you can prohibit stock movements. You can also use this procedure to take a physical inventory for storage bins and quants that are subject to continuous inventory, but have not had any stock movements in the current fiscal year. A product-specific periodic or annual inventory is also possible.

Continuous Physical Storage Inventory Procedures

Ad-Hoc Physical Inventory (Storage-Bin Specific and Product Specific)For storage bin-specific ad-hoc physical inventory, you take inventory for certain storage bins. You can do this at any time of the fiscal year. This physical inventory procedure is manually controlled. The product-specific ad-hoc physical inventory is similar to storage bin-specific procedure, except that you perform it on products.

Putaway Physical Inventory:When stock if first placed on an empty bin in the fiscal year, the inventory process is triggered. The warehouse employee confirms the warehouse task of putaway and as a result, performs the physical inventory.

Low Stock/Zero Stock Physical Inventory:As a prerequisite in this case, you must define (in Customizing) a quantity threshold of physical inventory area-specific settings. If picking causes levels to fall below the threshold, the low stock physical inventory is triggered. The warehouse employee confirms the picking warehouse task and the system creates the physical inventory document in the background. For a zero stock physical inventory, the threshold value is zero.

Low Stock/Zero Stock Check:The low stock / zero stock check is a variant of the low stock physical inventory, where no physical inventory document is created. This check can be done in addition to a low stock / zero stock physical inventory and in can be done multiple times (while a physical inventory document is only created once in a fiscal period).

Storage Bin Check:In this procedure, the system checks if a product is on the correct storage bin. This procedure can be triggered manually (at any chosen time). This check is recommended if a product is damaged. This check does not create a physical inventory document.

Product-Specific Cycle Counting

SAP EWM supports cycle counting, which means that you carry out a physical inventory of your stocks at regular intervals during a fiscal year. By allocating products to different classes (for example, A, B, and C), you specify the intervals or cycles when you take a physical inventory of those products. This allows you to take inventory of fast-moving products in your warehouse more frequently than inventory of slow-moving products, for example.

Prerequisites for Physical Inventory Procedures

In addition to the customizing settings for physical inventory, it is necessary to create physical inventory areas and then assign them to activity areas.

For each physical inventory area, you can define the related procedure of physical inventory. Also, you maintain Tolerance Groups to clear differences and to use the Difference Analyzer.

The process of physical inventory begins with the creation of a physical inventory document. This can be created manually or automatically. This document is used to do the following:

- Plan and perform the physical inventory
- Record the count data
- Post any differences revealed by the count

Physical Inventory Document

The physical inventory document can be printed using Post Processing Framework (PPF) and this printed document can be used during the count, or counting can be performed using radio frequency (RF) as in mobile data entry.

When creating the document, you can decide if the storage bin is locked during the physical inventory. If you perform the physical inventory by RF, it is not necessary to lock the storage bin.

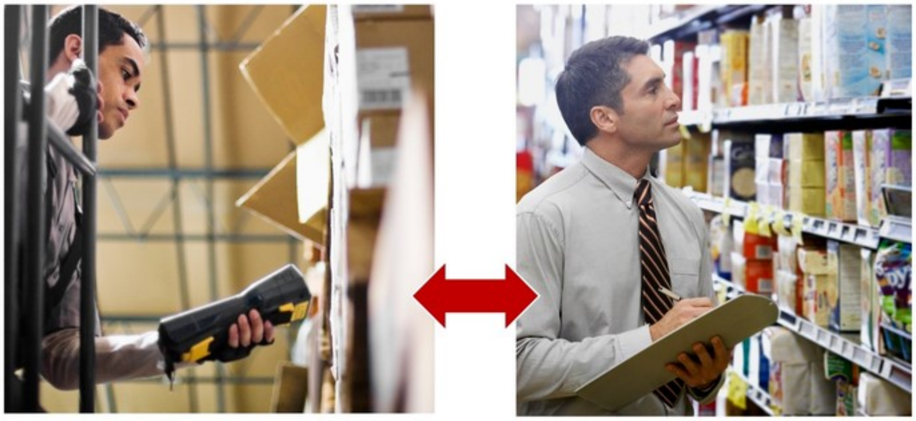


Figure 84: Physical Inventory with Mobile Devices or with Paper

The physical inventory document can be automatically active. You can activate it manually when you create the document or you can create it in an inactive state and activate it in a later step.

After the physical count is complete, the results of the count are entered in the system. Any differences can be checked using the Difference Analyzer tool and those differences must be posted to the ERP system, that is, when the quantity on a storage location level in ERP is updated.

Physical Inventory with an External System

It is also possible to perform the physical inventory with an external system. This is used for inventory sampling.

SAP EWM offers transactions to upload and download storage bins and to count data. Use the following menu path and transactions: *Physical Inventory* → *Periodic Processing* → *Upload / Download Storage Bins and Count Data* .

Stock Comparison

Under *Periodic Processing* , there is a transaction to compare the stock situation between SAP ERP and SAP EWM (`SCWM/ERP_STOCKCHECK`). This transaction is useful if there are differences between the stock quantities in ERP and SAP EWM.

On the ERP side, the displayed stock is cumulative at the storage location level. This transaction assumes that the stock in SAP EWM is the correct stock quantity and it adjusts the quantity on SAP ERP side.

LESSON SUMMARY

You should now be able to:

- Perform a physical inventory

Unit 5

Learning Assessment

1. Which of the following factors influence replenishment quantity?

   Choose the correct answers.

   ☐ A Availability of transportation
   ☐ B Predefined stock levels
   ☐ C Demand forecasts
   ☐ D Supplier availability
   ☐ E Cost

2. In planned replenishment, when is replenishment triggered?

   Choose the correct answer.

   ☐ A When the stock reaches zero
   ☐ B When the stock is less than the minimum quantity
   ☐ C On a predefined date
   ☐ D Only when it is triggered manually

3. If you perform the physical inventory using SAP ERP and SAP EWM and if there is a difference with the stock levels, we assume that the stock in SAP EWM is the correct stock quantity.

   Determine whether this statement is true or false.

   ☐ True
   ☐ False

Unit 5

Learning Assessment - Answers

1. Which of the following factors influence replenishment quantity?

   Choose the correct answers.

   ☐ A Availability of transportation

   ☒ B Predefined stock levels

   ☒ C Demand forecasts

   ☐ D Supplier availability

   ☐ E Cost

2. In planned replenishment, when is replenishment triggered?

   Choose the correct answer.

   ☐ A When the stock reaches zero

   ☒ B When the stock is less than the minimum quantity

   ☐ C On a predefined date

   ☐ D Only when it is triggered manually

3. If you perform the physical inventory using SAP ERP and SAP EWM and if there is a difference with the stock levels, we assume that the stock in SAP EWM is the correct stock quantity.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False

UNIT 6

Optimization of Resources

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UNIT OBJECTIVES

- Describe wave management
- Apply wave management
- Apply Labor Management
- Create a processor business partner
- Set up labor times
- Process a pick with labor management
- Plan efforts in labor management
- Create production supply master data
- Perform the production supply process
- Execute expected goods receipts processes
- Use cross-docking

Unit 6
Lesson 1

Applying Wave Management

LESSON OVERVIEW

In this lesson, you learn how to apply wave management in SAP EWM.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Describe wave management
- Apply wave management

Wave Management

Warehouse request items are grouped in a "wave" to be processed together at approximately the same time. The wave controls warehouse activities such as picking, stock transfers, and posting changes.

A fundamental goal of wave management is to create the warehouse tasks as early as necessary, but as late as possible. This is to achieve optimal efficiency and to ensure that the products to be delivered are available at the appropriate time in the goods issue zone.

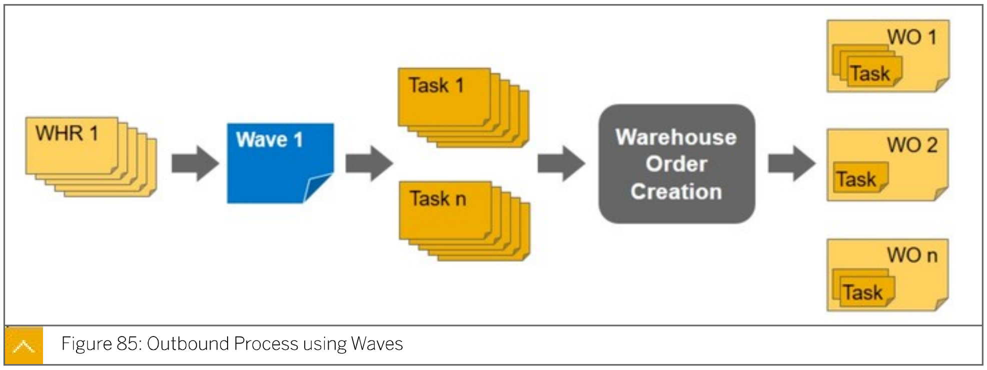


Figure 85: Outbound Process using Waves

Wave Items

The wave item information results from the outbound delivery item that is assigned.

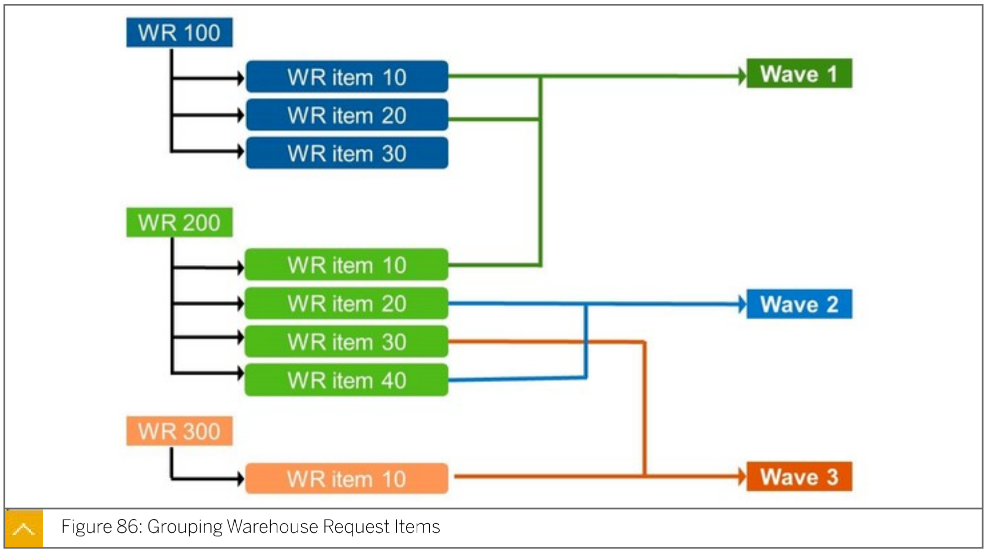


Figure 86: Grouping Warehouse Request Items

A wave is created by combining warehouse request items (from different warehouse requests). The warehouse requests and the warehouse request items do not need to have anything in common or any relationship for this – but of course, the idea of the wave is to optimize and speed up the picking process, so certain fields, like the route, or the ship-to-party, are usually the same.

Wave Templates

Warehouse request items are grouped into waves based on settings in the wave template.

The wave template is SAP EWM master data. It consists of attributes that define how warehouse request items are processed. With a wave template, you can reuse the same wave attribute for different warehouse request items that have the same conditions.

A wave template is made up of:

- Release method. Possible values are: Automatic, Immediate, and Manual.
- Wave type. Different wave types enable specific monitoring in the Warehouse Management Monitor.
- Wave category. You can use this as a filter for warehouse order creation rules.
- Date- and time-related fields. These are used to determine wave start and completion dates, and times, for example.
- Capacity profile. This is used for defining capacity limits.
- Calendar. This is used for defining workdays.

After a wave template is created, it can be applied manually during manual wave creation or it can be used automatically during warehouse request document processing.

Automatic Wave Assignment

You can automate the assignment of warehouse request items to waves. SAP EWM uses the condition technique to determine wave templates. This enables SAP EWM to determine which wave template corresponds to data from the header, item, or split item of a warehouse request.

The system then uses the planned completion time of the warehouse request items to find the wave option with the fitting wave completion-time. The system creates a wave with the option that has a wave completion-time not later than the planned completion time of the warehouse request item.

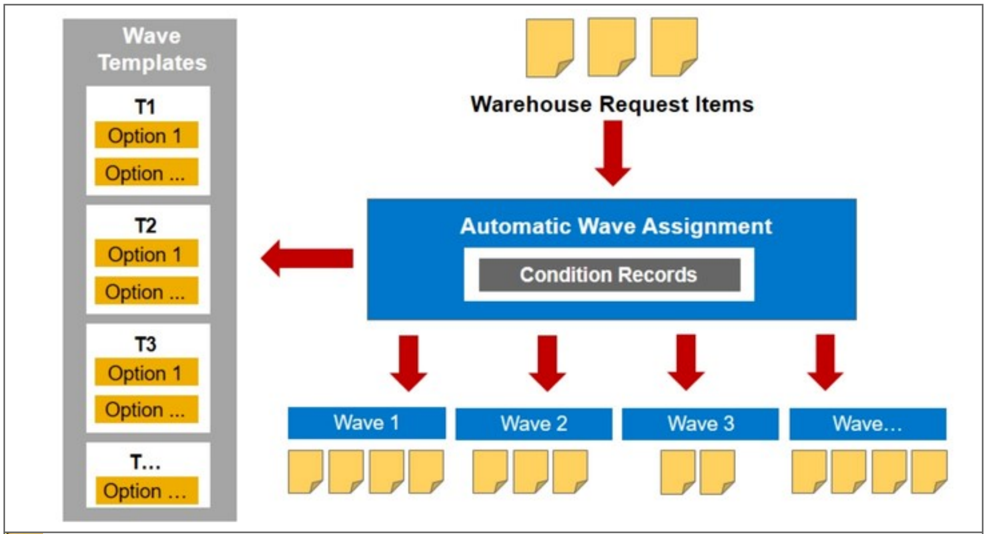


Figure 87: Automatic Wave Assignment

Automatic wave assignment is triggered by a customizing setting in the warehouse process type. A warehouse process type is assigned to every warehouse request item.

Wave Processing

After waves have been created, they can be processed in a number of ways:

- Waves can be locked or unlocked. This function allows you to block and unblock a wave from further processing.
- Waves can be merged.
- Waves can be released. This action creates warehouse tasks and subsequent warehouse orders for the warehouse request items in a wave.
- Waves can be deleted. This action removes all warehouse request items from a wave.

In addition to these activities, the data associated with wave management can be viewed in the Warehouse Management Monitor. All activities that can be started by wave processing can also be started from the Warehouse Management Monitor.

LESSON SUMMARY

You should now be able to:

- Describe wave management
- Apply wave management

Unit 6
Lesson 2

Applying Labor Management

LESSON OVERVIEW

Labor Management allows customers to manage and make better-use of their warehouse resources. This reduces costs. This lesson shows you how to get the best from Labor Management.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Apply Labor Management
- Create a processor business partner
- Set up labor times
- Process a pick with labor management
- Plan efforts in labor management

Overview

One of the biggest cost factors in a warehouse is human labor. Labor Management (LM) records, measures, visualizes, and documents the productivity of employees. LM functionality also helps to determine the number of employees required for the current workload.

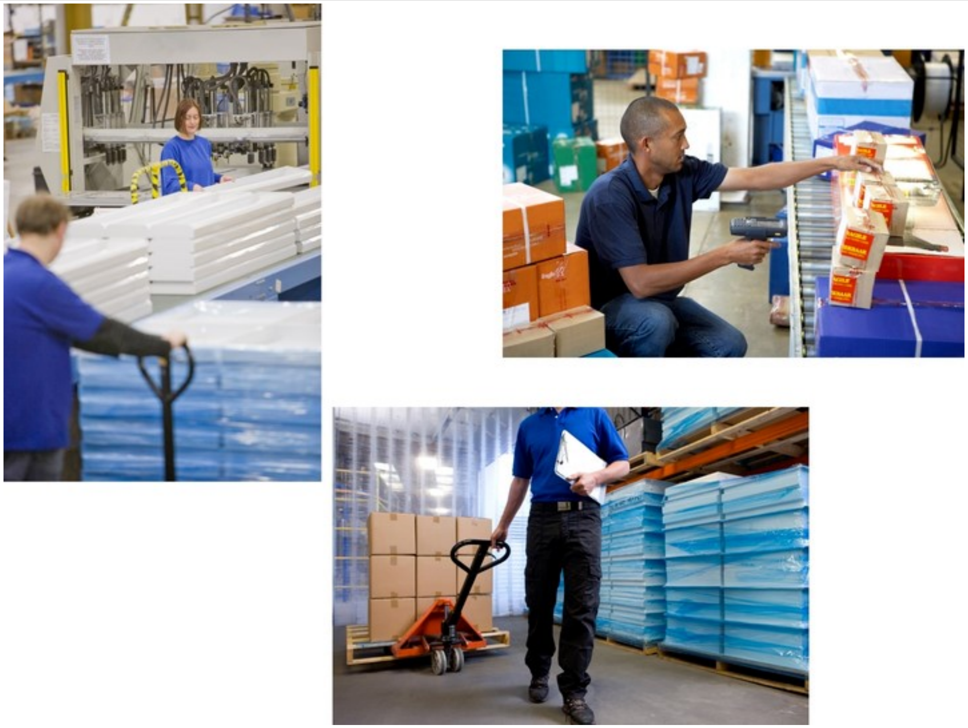


Figure 88: Labor Management

Using engineered labor standards, LM functionality helps you to evaluate the performance of your warehouse employees. After executing a planned task, LM can compare the time planned for that task and the actual time required for that the task (for an employee). LM functionality can trigger incentives such as bonus payments using a HR system (which can be connected).

Labor Management Activation

Before you can use any function in Labor Management, LM must be activated in Customizing. This is done at the warehouse level and at the internal process step level. LM can then be deactivated for selected external process steps. Through this combination, it is possible to decide in great detailed which processes are really LM relevant.

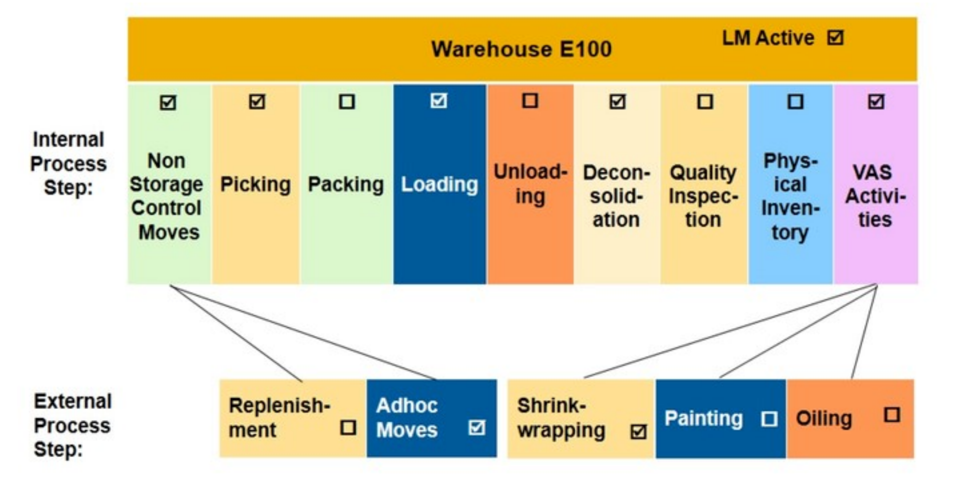


Figure 89: Labor Management Activation

After LM is activated, certain processing transactions require that a processor, start time, and end time be entered. The transactions affected by this can be:

- Warehouse order confirmation
- Physical inventory processing and counting
- VAS processing transactions
- Quality management-related transactions

In work center-related transactions, the end times are determined automatically from the warehouse time if they are not entered manually.

In RF, start and end times are determined automatically and the processor is determined based on log on information provided by the system.

Master Data

In addition to the data already provided in SAP EWM, master data must be entered in Labor Management (LM). This data represents the warehouse employee and is defined as a business partner with the role of processor.

If a processor uses RF, he or she is linked to their processor number through their system user-id. When a processor executes a warehouse order, the start date and time are automatically recorded. The end date and time are logged when the warehouse order is confirmed.

The master data processor has important information recorded about the processor, including:

- Their warehouse assignment
- The process steps he or she executes
- Their labor factor (representing his or her rating)

By selecting relationships, you can define the processor's role in a group. For example, as a group leader the processor has more authorizations than as a group member.

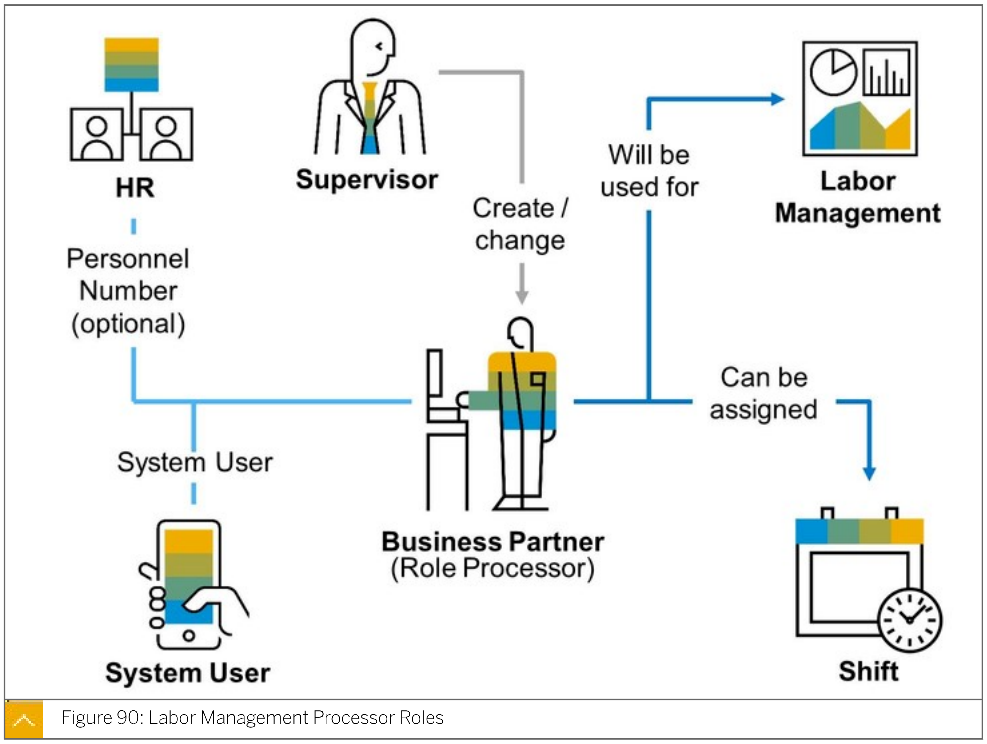


Figure 90: Labor Management Processor Roles

Note:
With SAP S/4HANA, the Business Partner concept for Business Users has been extended. Because of this it is not possible anymore to maintain the *Personnel Number* and the *System User* in the business partner transaction. For details see SAP Note 2570961 - Simplification item S4TWL - Business User Management.

Shifts

Shifts are used to define the work schedule for processors working in a warehouse. You can assign breaks and a shift factor to a shift, which reduces the productive working time of the shift. Shift sequences are used to define a shift order for as many consecutive days as required. The shift sequence repeats itself in cycles, for example, every five days for a five-day shift sequence.

You can use shifts to determine the productive labor capacity at a certain point of time in your warehouse. You can also determine the labor performance of a shift if you have Labor Management activated. For example, when a processor confirms a warehouse task, the system records the processor's shift into the executed workload record for future labor performance evaluation.

Processors in the Warehouse Management Monitor

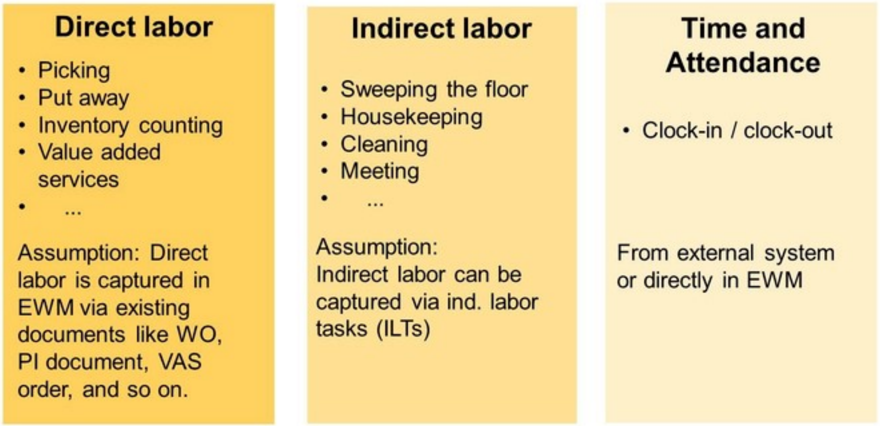
Information related to processors can also be viewed in the Warehouse Management Monitor.

The Warehouse Management Monitor can be used to perform mass maintenance of processors and to display LM-relevant information. If LM is activated, additional nodes are available in the Warehouse Management Monitor, such as:

- Planned workload: The planned workload reflects the work expected in the warehouse. Each data record references an open object that is still to be processed, such as an open warehouse task. You can use the planned workload to perform warehouse planning.
- Executed workload: The executed workload reflects the work that has been completed in your warehouse. Each data record references a completed object, such as a confirmed warehouse task.
- Labor utilization: This is an aggregated view of the executed workload. You can use *Efficiency* to evaluate the performance of your employees. Under the utilization information, you can use the following tools to evaluate the performance of the processor:
    - Actual data comparison
    - Direct and indirect labor
    - Processor attendance
- Indirect labor task: This shows the labor that is not an obvious part of a process, but is still a necessary task.

Labor Time Definitions

There are three basic types of labor time. Direct labor is recorded when a Labor Management-relevant document such as a warehouse order is completed. Indirect labor can be captured for activities not connected to a standard warehouse activity, using a indirect labor task (ILT). Time and attendance is used to store time events like clock-in and clock-out.



Direct labor

- Picking
- Put away
- Inventory counting
- Value added services
- ...

Assumption: Direct labor is captured in EWM via existing documents like WO, PI document, VAS order, and so on.

Indirect labor

- Sweeping the floor
- Housekeeping
- Cleaning
- Meeting
- ...

Assumption: Indirect labor can be captured via ind. labor tasks (ILTs)

Time and Attendance

- Clock-in / clock-out

From external system or directly in EWM

Figure 91: Labor Definitions

Planned and Executed Workload

To capture data for planned and executed workload, corresponding documents are created in SAP EWM for the planned workload and for executed workload.

The planned workload document shows the planned duration, calculated by engineered labor standards. The document for the executed workload contains the planned duration and actual duration (including processor and start- and end-time of the execution.)

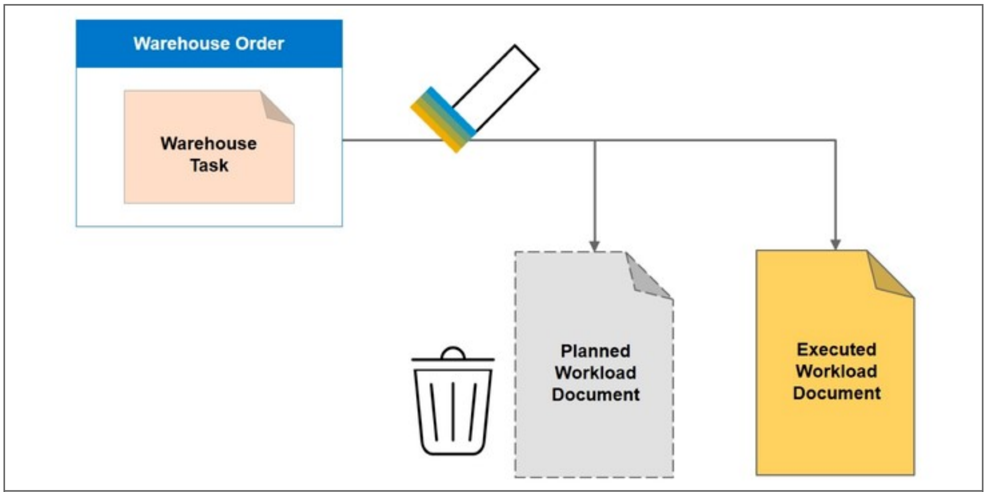


Figure 92: Planned and Executed Workload Document

You use the document for the planned workload as a basis for planning your resources. After executing the planned work, the system sends the relevant information to the executed workload document, and then deletes the planned workload document. The document for the executed workload can be used to compare the planned and actual durations. You can send the result of your evaluation to a HR system, using a performance document. This may then trigger a bonus payment, for example.

Performance Document

Performance documents are used to evaluate the executed workload (EWL) cumulatively for each processor. A performance document enables you to perform an employee-related evaluation of the executed workloads for a chosen time-period. It contains the cumulative planned and actual execution durations of the assigned executed workload and the labor time of the employee. Use this to draw conclusions about the performance or utilization of the employee.

Labor Activities

When a workload is created or an incomplete executed workload is completed, the system determines a labor activity. For example, a labor activity is determined for the workload for a warehouse order that includes one or more warehouse picking tasks.

There are two approaches to determining labor activities:

- Using active labor activities directly

  The system uses this approach if there is a 1:1 relationship between an active labor activity at the warehouse level and an external process step. This approach is always used for indirect labor, for example, changing a battery.

- Using a decision service in BRFplus

  The system uses this approach if there is not a 1:1 relationship between a labor activity and an external process step, for example, in the case of picking or staging. A decision service in BRFplus determines the labor activity at runtime by considering context-dependent information such as external process step, activity area, material group, location, or reference document data (such as warehouse order).

If you do not use labor activities, you use external process steps and a work step sequence to determine the required time. You do not need to use labor activities to calculate travel time, or to define engineered labor standards (ELS). However, there are several advantages to using labor activities.

Travel Distance Calculation

The travel distance calculation calculates the distance that a warehouse worker must travel to complete a warehouse order. The distance can be calculated directly or by using networks. Such networks can be created manually or programmatically. If a network does not exist, the system uses one of two distance calculation techniques: the Euclidean method or the Manhattan method.

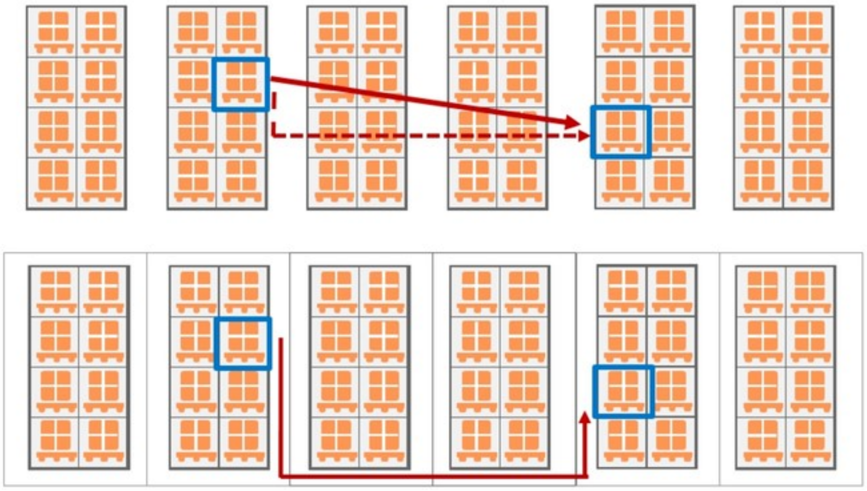


Figure 93: Travel Distance Calculation

There are two types of networks:

- Storage type-specific networks, which you define for each storage type
- Global networks, which connect storage type-specific networks to each other

Travel Distance Calculation Networks

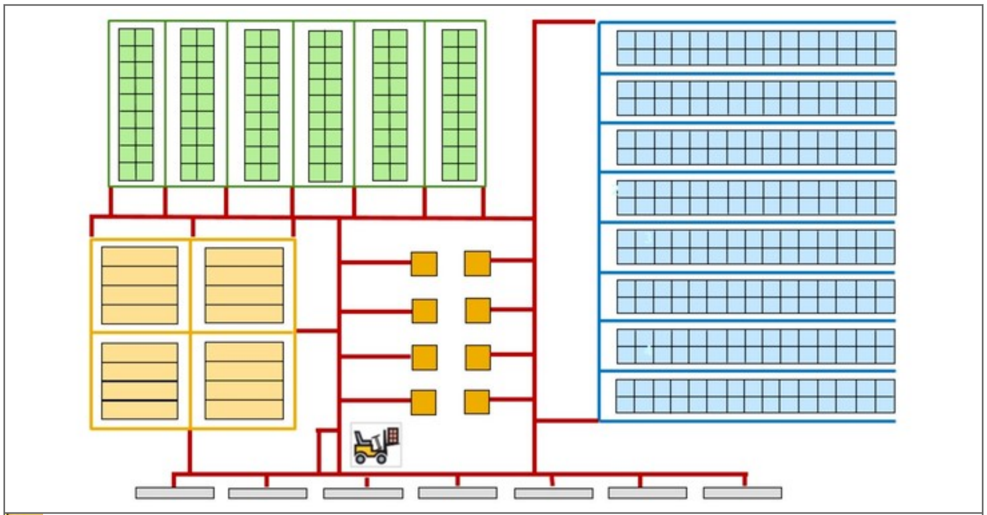


Figure 94: Networks

Calculation of the Shortest Path

The calculation of the shortest path within a network uses several heuristics:

- Fast depth-first search to get a solution
- Breadth-first search to improve the first solution

In addition to calculating travel distance, the system determines the time required by a worker to execute the warehouse order. This time depends on the speed of the worker in the task used.

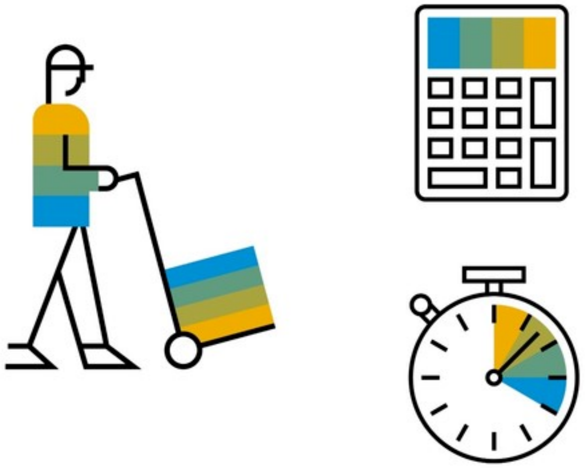
If Labor Management (LM) is activated, the system saves the result of the travel distance calculation in the planned and executed workload.

The result of the travel distance calculation is used for:

- Planning the workers in Labor Management (LM)
- Calculating engineered labor standards (ELS)
- Calculating the latest start time for a warehouse order

Travel Time Calculation

You can use BRFplus to calculate the travel time for planned workloads and the adjusted travel time for executed workloads. The travel time is recalculated to give the adjusted travel time because it is not known which resource executes the workload until the executed workload is confirmed. Therefore, the adjusted travel time takes into account additional information such as the actual speed of the resource.



(Horizontal travel distance / Horizontal resource type speed) + (Vertical travel distance / Vertical resource type speed) + Section information = **Total Travel Time**

Figure 95: Travel Time Calculation

If you do not configure any BRFplus content, the system calculates travel time based on SAP EWM fallback logic. There the total travel time is the horizontal travel time plus the vertical travel time. With BRFplus you can also used **consolidated section information**This lets you consider each section of the calculated travel path separately. For example, you might want to consider turns and stops in the travel path, because they limit the maximum speed of a resource. The shorter a straight segment is, the less likely it is for the resource to travel at its maximum speed.

Engineered Labor Standards (ELS)

Engineered labor standards (ELS) are used to define the times that are required to execute an activity in the warehouse. The system calculates ELS when:

- Creating a document, when the system generates planned workload.
- Confirming a document, when the system generates executed workload.

The system saves labor standards in the planned workload as planned duration, and in the executed workload as an adjusted planned duration. Final data is only available when the document is confirmed because it is then when the executing resource is known. Other final data includes:

- Speed of the resource
- Last position of the resource prior to executing the activity
- Travel distance allowed for the resource

The system uses this additional data for the travel distance calculation. It saves the results of the travel distance calculation in the planned and executed workload. (You can include a formula or condition as parameters when defining the engineered labor standards.)

	Time (s)	Reason
Read document	5	Constant time for reading
Walk to first bin	15	Travel time
Pick toy	10	Time for picking dependant on weight
Walk to next bin	11	Travel time
Pick toy	20	Time for picking dependant on weight
Walk to next bin	13	Travel time
Pick toy	2	Time for picking dependant on weight
Walk to next bin	35	Travel time
Pick carton	8	Time for picking dependant on weight
Walk to packing station	60	Travel time
Total time		179

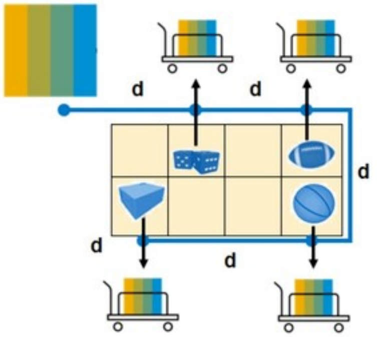


Figure 96: Planned Time

Options for Engineered Labor Standards

You can define your ELS in the following ways:

- By using settings based on work step sequences containing conditions and formulas.

  You split up an activity into work steps, which the warehouse worker must execute sequentially, and which make up a work step sequence. The planned time for the activity is then made up of the total of all planned times of the individual work steps in the work step sequence.

- By using BRFplus.

  SAP recommends using BRFplus to define your ELS if you have simple decision-table-based time calculations. You define rules in BRFplus for the ELS to calculate the normal time of workloads. You assign these rules to the corresponding decision service. When calculating the normal time, the ELS considers context-dependent information such as product, location, and reference document data.

Processes with Labor Management

Whenever a document such as a warehouse order, a physical inventory document, or a value-added service order is processed, and the activity in this document is connected with a Labor Management process step, it is necessary to enter the processor, and the end time of the processing of the document. When processing these documents with desktop transactions, the person entering the data is usually not the same person who did the physical process in the warehouse. This makes it difficult to use Labor Management when using desktop transactions, because it would mean that the processor has to write down the times for each document and the information must be transferred manually.

> Note:
> In that case, the system only requires the entry of the processor and the end time. If no start time is entered, the start time is set to be the same as the end time. So no comparison between the calculated time and the actual time is possible.

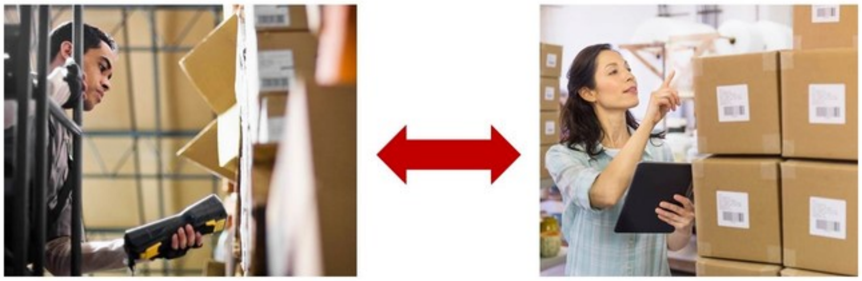


Figure 97: Labor Management RF vs Paper Based

When working in the RF environment, the system determines the times automatically. One condition for this is that the user working with a resource is connected to a processor.

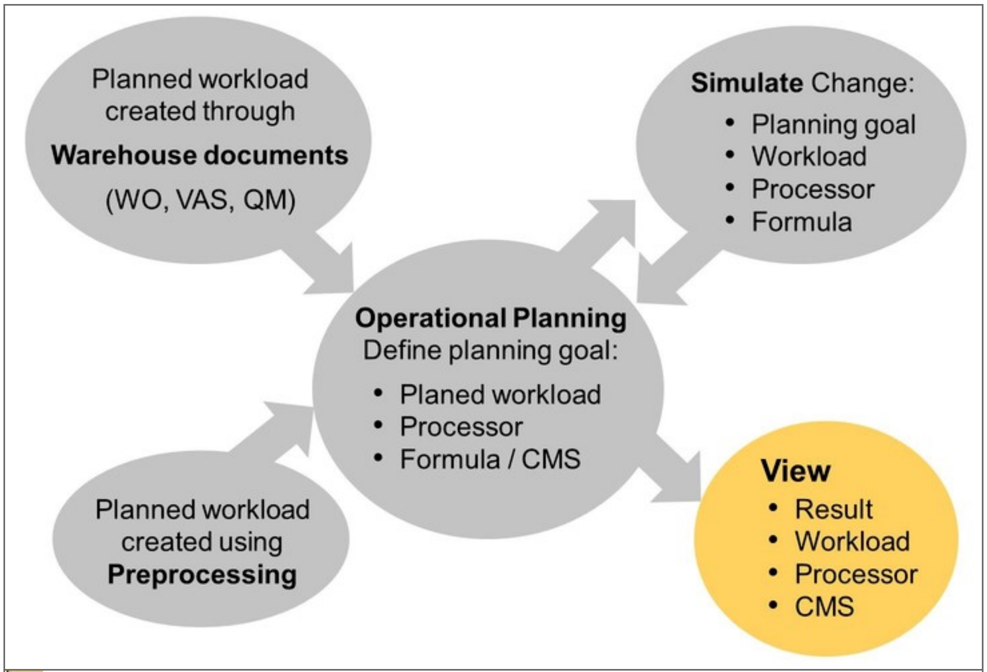
Planning and Simulation

Planning and simulation has two primary functions:

1. Operational planning, including preprocessing
2. Simulation of planning

Preprocessing operational planning is necessary, for example, when the user wants to plan work that has to be done the next day, but warehouse internal documents are not available. Preprocessing gives an overview of the workload that arises at a particular time for inbound and outbound deliveries or in the physical inventory for cycle-counting. In terms of time, this determination comes before the execution. It comes before warehouse tasks and warehouse orders are created for delivery items or for cycle-counting documents. Preprocessing results are only used for planning purposes. These results do not affect the actual execution.

This figure, Basic Concepts of Planning, illustrates the planning process.



Planned workload created through **Warehouse documents** (WO, VAS, QM)

Simulate Change:
- Planning goal
- Workload
- Processor
- Formula

Operational Planning
Define planning goal:
- Planed workload
- Processor
- Formula / CMS

Planned workload created using **Preprocessing**

View
- Result
- Workload
- Processor
- CMS

Figure 98: Basic Planning Concepts

Operational Planning

Operational Planning is used to define the calculated planning goals based on workload, processors, and a calculated measurement service (CMS). Create the planning formula in the formula editor. A planning formula is valid for one warehouse number and external process step and it is intended for calculating the number of required employees based on the planned workload, for example. The planning is based on:

- The calculated measurement service (CMS)
- Aggregated information:
  - Planned workload
  - Planned workload created using preprocessing
  - Information about processors

Operational Planning:

- Provides a short-term overview of the warehouse (the next hours or days).
- Is used for short-term determination of work and resources.
- Provides a rough estimate of the workload.
- Considers one or more activity areas and external process steps.
- Is based on the aggregated values (workload, processor) and measurement services.

Operational Simulation

This function determines how changes in the planning environment, such as expected workload, would affect the result. The planning data can be changed manually, and then the planning formulas can be re-evaluated based on the changed data. You can change the aggregated information, such as planned workload and processor, as well as the detailed data of the individually-planned workload records, individual processors, and the results of the calculated measurement services.

The system only saves the changes temporarily. When the transaction is closed, the system discards the changes.

After each manual change, the system initializes the results of the planning formula. If automatic-planning is activated, the result is calculated again each time a manual change takes place.

LESSON SUMMARY

You should now be able to:

- Apply Labor Management
- Create a processor business partner
- Set up labor times
- Process a pick with labor management
- Plan efforts in labor management

Unit 6
Lesson 3

Executing the Production Supply Process

LESSON OVERVIEW

Production supply is the process of providing the materials necessary to fulfil a production order. In this lesson, you learn how to create the master data for production supply and perform the production supply process.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create production supply master data
- Perform the production supply process

Integration of Production Supply

Products in a warehouse can be used for different purposes, for example they can be:

- Sold to customers. Sales order and deliveries are created and the goods are picked from the warehouse for those deliveries.
- Used in production processes to manufacture more valuable products for sale.

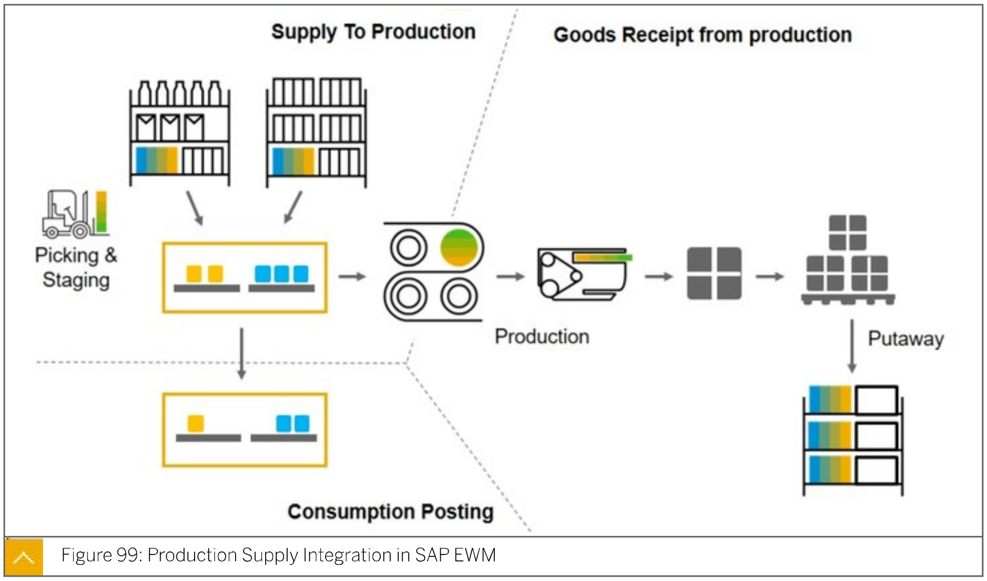


Figure 99: Production Supply Integration in SAP EWM

Manufacturing Order

The production process, which occurs in ERP, is based on a production order. In batch-oriented process manufacturing, it is called a process order. In the manufacturing order, the following details are specified:

- What will be produced
- When production will happen
- What resource will process the order
- How much the production will cost

When a manufacturing order is created, it is necessary to specify the components required for production. These components are listed in the bill of material (BOM) or a master recipe, and that is defined as master data in production. If a BOM or master recipe exists for the product to be produced, the BOM or master recipe is exploded when a manufacturing order is created, for example the quantity of each item that is required is calculated.

Delivery-Based or Advanced Production Integration

There are two models for production integration available in SAP EWM, a delivery-based model (where deliveries are sent as information from ERP to SAP EWM for requirements and goods issues) and the advanced production integration model (which does not use deliveries). Both models have specific features and the model used depends on the customer's requirements.

For a comparison of the integration scenarios, please see note 2352810 — FAQ: Using the PMR – Differences between PMR and Deliveries.

Table 3: Comparison Between Delivery-Based and Advanced Production Integration

The two production integration models have different features, which make them suitable for different production processes.

	Delivery Based Production Integration	Advanced Production Integration
Integration with ERP	Deliveries Separate documents for staging and consumption	Production Material Request One document for staging and consumption
Typical Scenario	Mechanical engineering	Consumer products or process industry
Supported Processes	Production orders Process orders Kanban Repetitive manufacturing	Production orders Process orders

Production Supply Areas

To stage products for a production order, a warehouse must know the location that products need to go to.

The production supply area (PSA) is an area in production or in the warehouse where products are staged or withdrawn. When SAP EWM is used, production supply areas are defined in ERP and in SAP EWM. These are then mapped to each other.

PSAs can be created manually in SAP EWM or they can be replicated from ERP. If they are replicated from ERP, the mapping is done at that time. If the PSAs in SAP EWM are created manually, they need to be mapped manually to the corresponding PSAs in ERP.

In SAP S/4HANA embedded EWM, a PSA which is relevant for EWM is automatically replicated to EWM.

Staging Methods

When staging products for a production order or process order, the products are transported to the production supply area (PSA). It is necessary to distinguish on the ERP side between the delivery based and the advanced production integration. But also in the delivery based production integration products can be staged differently, depending what type of materials you have and how they can be used in different manufacturing orders. The different ways are described by the staging method. The following staging methods or types are available.

Staging Method	Definition
Pick Parts	The materials are picked according to the required quantity that is specified in the production order.
Release Order Parts	The pick quantities for release order parts are based on the requirements of several production orders (not individually as for pick parts) and on the stock levels in the scheduled production supply areas.
Crate Parts	A crate part is a material that is staged independently of manufacturing orders. The material is used continually and it is usually stored in a crate or another standard container. Kanban is a special method for managing crate parts.
EWM staging	These materials are staged directly in SAP EWM using a production material request. If a material is staged with single-order staging (similar to a pick part) or with cross-order staging (similar to a release order part) is assigned in SAP EWM.

For the definition of the staging method, you maintain **control cycles**in ERP. You also need to maintain a control cycle in SAP EWM for further details (especially for pick parts and for SAP EWM staging) and to assign the bin for staging.

Organizational Model for Production Supply

There are different models for organizing stocks in the PSA, such as the following models:

1) Separate (SAP EWM-managed) storage locations in one warehouse

The system manages the stocks in the PSA separately from other stocks. This increases the transparency at the storage bin level in SAP EWM, and at storage location level in ERP. When staging at the PSA, SAP EWM executes a posting change by changing the stock type. In ERP, this corresponds to a stock transfer between the storage locations.

> Note:
> This model is supported by delivery-based production integration and is also possible with the advanced production integration.

2) One (SAP EWM-managed) storage location

The PSA stocks are managed in SAP EWM, and are available in that system only. When staging at the PSA, the system does not execute a posting change.

> Note:
> This model is supported by delivery-based production integration and advanced production integration.

3) MM-IM-managed storage location for production

The products come from an SAP EWM-managed storage location but the storage location for production is MM-IM-managed. Therefore PSA stocks are not managed in SAP EWM. Staging at the PSA is an outbound delivery from the SAP EWM's perspective, and a posting change to a storage location (outside of SAP EWM) from the ERP's perspective.

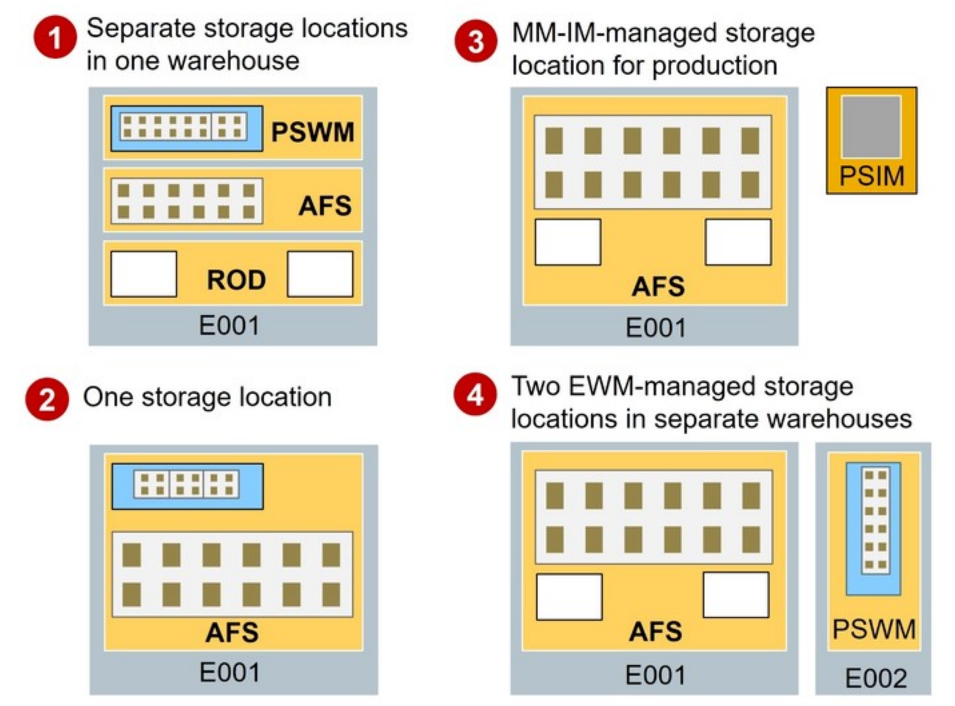
> Note:
> This is only possible using delivery-based production integration.

4) Two SAP EWM-managed storage locations in separate warehouses

The PSA stocks are managed in the SAP EWM system of another warehouse. Staging takes place in a two-step posting change:

1. Posting of the outbound delivery from the SAP EWM warehouse (that is sending).
2. Posting of the inbound delivery of the SAP EWM warehouse (that is receiving).

> Note:
> This is only possible using delivery-based production integration.



1 Separate storage locations in one warehouse
PSWM
AFS
ROD
E001
2 One storage location
AFS
E001
3 MM-IM-managed storage location for production
AFS
E001
PSIM
4 Two EWM-managed storage locations in separate warehouses
AFS
E001
PSWM
E002

Figure 100: Organizational Models for Production Supply

> Note:
> In addition to the possibilities shown in the slide, you can also have a mix of the organizational models 1 and 2, that is, two separate storage locations for using the ROD/AFS scenario, but no separate storage location for production.

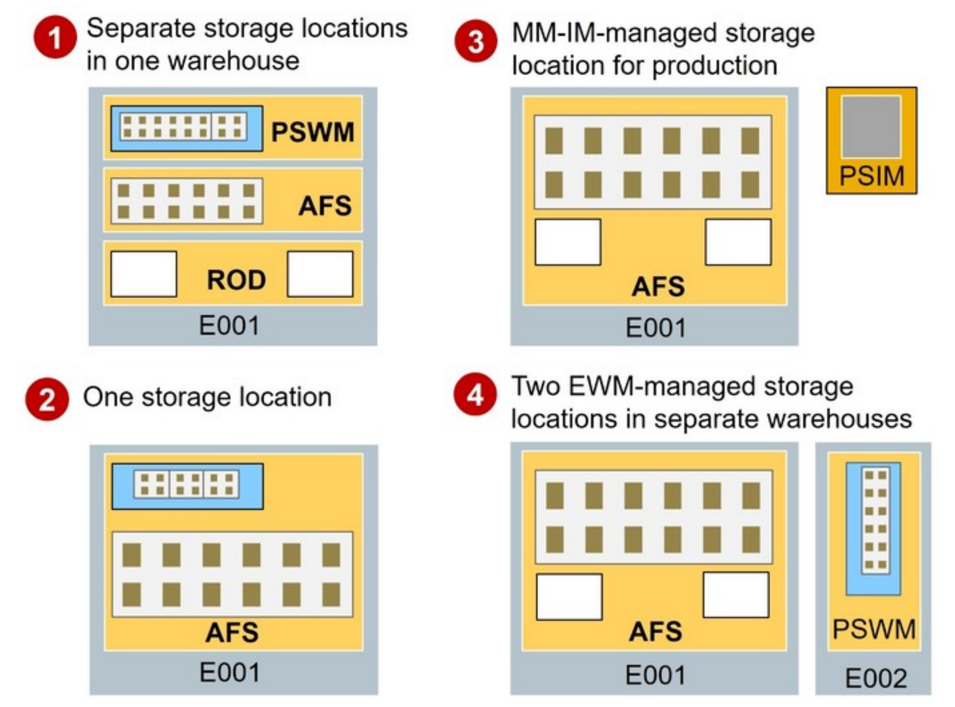
Storage Bins for Production Supply

In SAP EWM, the PSA contains one or more storage bins where the products required for the production order are physically staged. For this reason, SAP EWM needs information about the PSAs to find the correct storage bin for staging the products. This correct bin depends on:

- Product number
- Party entitled to dispose
- PSA

One PSA can have multiple storage bins and one storage bin can be used by multiple PSAs. A storage bin can be assigned to a combination of product and party entitled; product group and party entitled; or party entitled only, always in connection to a PSA. Therefore, the storage bin is not assigned to a PSA directly. Instead, the storage bin for the staging of a particular product or product group or a party entitled to dispose within a PSA is defined.

Using the organizational models with an MM-IM-managed storage location for production or with two SAP EWM-managed storage locations in separate warehouses, there is no need to enter storage bins. As an alternative, the *Staging determination for Outbound Delivery* can be set. If that is the case, the system determines the staging areas (as it does in the standard outbound delivery process).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PSWM
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4 Two EWM-managed storage locations in separate warehouses
AFS
E001
PSWM
E002

Figure 100: Organizational Models for Production Supply

> Note:
> In addition to the possibilities shown in the slide, you can also have a mix of the organizational models 1 and 2, that is, two separate storage locations for using the ROD/AFS scenario, but no separate storage location for production.

Storage Bins for Production Supply

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Using the organizational models with an MM-IM-managed storage location for production or with two SAP EWM-managed storage locations in separate warehouses, there is no need to enter storage bins. As an alternative, the *Staging determination for Outbound Delivery* can be set. If that is the case, the system determines the staging areas (as it does in the standard outbound delivery process).

Process of Production Supply

The process of the SAP EWM production supply is divided into two main steps. These are:

- Staging: Stock is moved from the warehouse to the production supply area.
- Consumption: Products are withdrawn from the PSA and that consumption is posted in the system.

The details of the staging process depend on the type of the production integration (delivery-based or advanced production integration) and different organizational models (as described earlier), for example:

- In an environment with two storage locations sharing one physical warehouse and using delivery-based production integration, the production supply delivery is done through a posting change.
- In an environment where two separate warehouses are involved, production supply is triggered by inbound and outbound deliveries. Only delivery-based production integration supports this process.

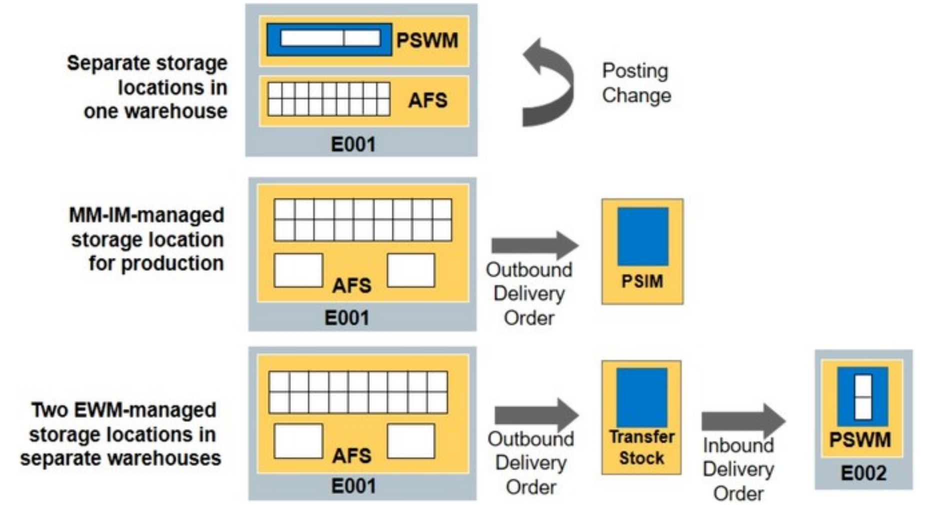

Separate storage locations in one warehouse
PSWM
AFS
E001
Posting Change
MM-IM-managed storage location for production
AFS
E001
Outbound Delivery Order
PSIM
Two EWM-managed storage locations in separate warehouses
AFS
E001
Outbound Delivery Order
Transfer Stock
Inbound Delivery Order
PSWM
E002

Figure 101: Process Scenarios with Delivery-Based Production Integration

> Note:
> The figure with the organizational options shows 4 possibilities, while the above figure shows only 3. The reason for that is that when the products stay inside the warehouse, with 1 or 2 storage locations, the created document is always a posting change.

Another factor that influences the process is the definition of products as either pick parts, release order parts, crate parts, or SAP EWM staged parts.

The staging process for pick parts and release order parts is triggered from the ERP system and that creates a delivery which is then replicated in the SAP EWM system. For crate parts, the material staging is triggered as a replenishment process in the SAP EWM system. For SAP

EWM staged parts, a production material request is created directly in SAP EWM (not shown in the slide for Process Scenarios).

LESSON SUMMARY

You should now be able to:

- Create production supply master data
- Perform the production supply process

Unit 6
Lesson 4

Executing Expected Goods Receipts Processes

LESSON OVERVIEW

Expected goods receipt processing allows you to create goods receipts without having to wait for the inbound delivery from ERP. In this lesson, you learn how to execute expected goods receipt processing.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Execute expected goods receipts processes

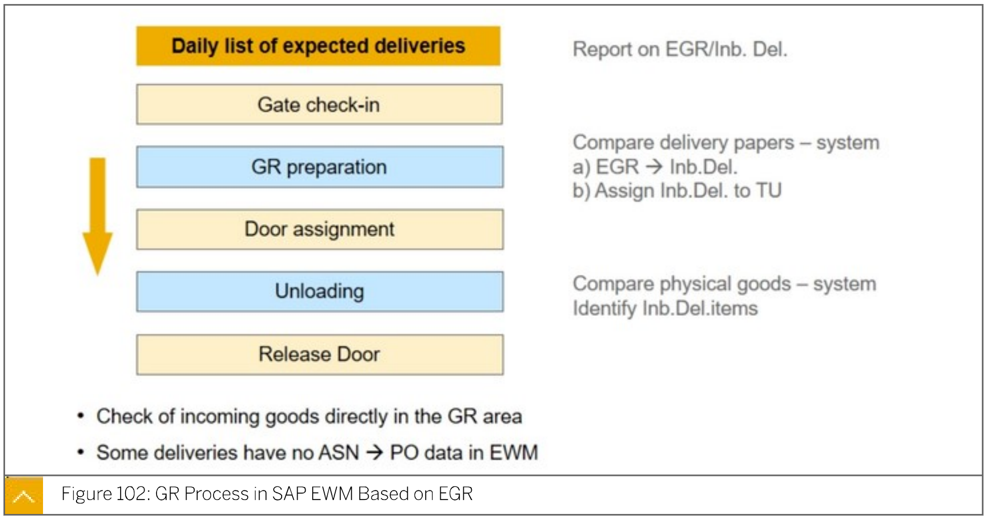
Overview of Goods Receipts Documents

The main feature of expected goods receipt (EGR) processing is the ability to plan goods receipts (GRs) within SAP EWM, without an inbound delivery in ERP. Using expected goods receipt offers advantages. For example, it serves as a template to create inbound deliveries (either automatically or manually) and calculations of expected workload can be based on expected goods receipt (and then displayed in the Warehouse Management Monitor).

If an expected goods receipt is used to generate an inbound delivery manually for a purchase order or production order, the process has the following advantages:

- Execution of the good receipt process starts in SAP EWM.
- If ERP is temporarily unavailable, you can still execute the physical goods receipt process.
- The inbound delivery data has been checked by both ERP and SAP EWM. This ensures a posted goods receipt in ERP also.
- Since the expected goods receipt is based on an open purchase order or open production order data, you can use the expected goods receipt as a preview of the goods receipt.

The figure, GR Process in SAP EWM Based on EGR, shows how the SAP EWM GR process uses EGR data as part of the product check-in process.



Daily list of expected deliveries

Report on EGR/Inb. Del.

Gate check-in

GR preparation

Compare delivery papers – system
a) EGR → Inb.Del.
b) Assign Inb.Del. to TU

Door assignment

Unloading

Compare physical goods – system
Identify Inb.Del.items

Release Door

- Check of incoming goods directly in the GR area
- Some deliveries have no ASN → PO data in EWM

Figure 102: GR Process in SAP EWM Based on EGR

In this process, any product that is received, but does not appear in an existing inbound delivery, can still be received. The inbound delivery can be updated from the expected goods receipt data.

Expected Goods Receipts Documents

There are two methods to transfer data from the purchase order or production order. As a result, an expected goods receipt notification document is created:

- Push Scenario: The process is triggered in ERP by executing the report /SPE/INB_EGR_CREATE. (This is transaction `/SPE/EGR`).
- Pull Scenario: The process is triggered in SAP EWM by executing the report /SCWM/ERP_DLV_DELETE. (This is transaction `/SCWM/ERP_EGR_DELETE`).

In both the push scenario and the pull scenario, the consistency check of data is automatic. With the transaction code `/SCWM/EGR`, it is also possible to execute the consistency check manually in SAP EWM.

The Notification of Expected Goods Receipt (GRN) is created based on either a purchase order or production order in ERP. This interim document contains a copy of all of the relevant logistical data from the source document.

Based on the GRN, the EGR document is created either manually using a transaction (`/SCWM/GRN`) or automatically, using PPF. This document contains all of the relevant data from the GRN. It is a temporary document that exists in SAP EWM (and not in ERP). It is used as a template to manually create SAP EWM inbound deliveries.

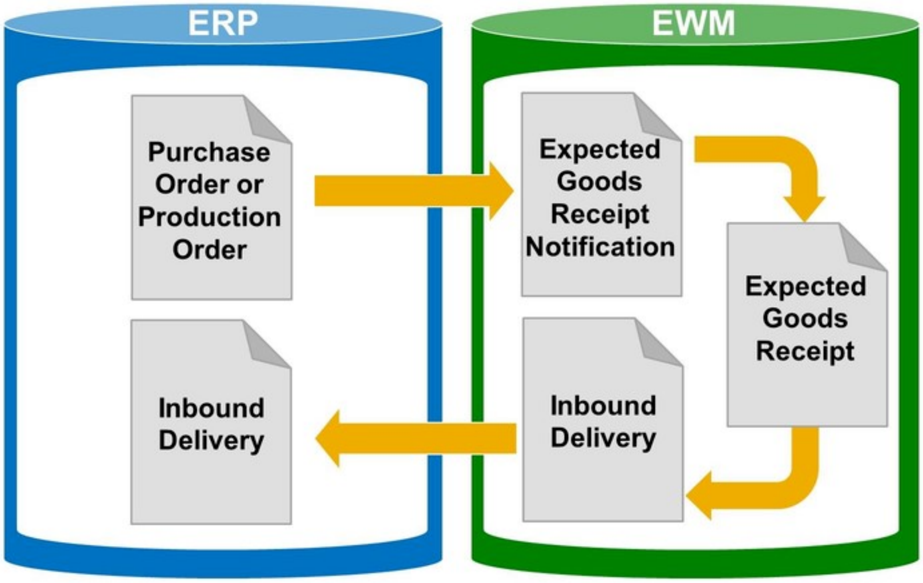

ERP
EWM
Purchase Order or Production Order
Expected Goods Receipt Notification
Expected Goods Receipt
Inbound Delivery
Inbound Delivery

Figure 103: Inbound Delivery Creation using Expected Goods Receipt

Based on the EGR document, an inbound delivery is created in the SAP EWM system. For this, there are two transactions:

- GR Preparation – External Procurement (`/SCWM/GRPE`)
- GR Preparation – Production (`/SCWM/GRPI`)

For an EGR for a production order, the inbound delivery can also be created through RF, but for this, it is expected that the material is packed in an HU (*Receive HU by Manufacturing Order*).

In a production integration scenario, it is also possible that no inbound delivery is created in ERP, but only a material document for the goods receipt posting.

Note:
In SAP S/4HANA embedded EWM, the whole scenario is simpler. The report to create the expected goods receipt documents (GRN and EGR) is not needed, these two documents no longer exist. With the transactions for GR Preparation, the inbound deliveries can be created directly with reference to a purchase order or a manufacturing order.

In a decentral EWM system, the expected goods receipt notification (GRN) can be skipped, similar to the other notification documents.

GR Workload List

Goods receipt processing enables the display of data to assist planning for products that are to be received into the warehouse (over a chosen time frame). This information is provided through the Goods Receipt Workload List.

The GR Workload List is executed with transaction `/SCWM/GRWORK`. It provides for time-dependent data aggregation, based on inbound deliveries and expected goods receipts. Data on the report is aggregated at these levels:

- Number of items
- Number of HUs (using a BAdI)
- Weight and volume
- Customer fields (using a BAdI)

LESSON SUMMARY

You should now be able to:

- Execute expected goods receipts processes

Unit 6
Lesson 5

Applying Cross Docking

LESSON OVERVIEW

This lesson describes the benefits and characteristics of cross-docking. You learn how to use cross-docking in SAP EWM.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Use cross-docking

Basics of Cross-Docking

Cross-docking helps you reduce your warehouse stock and transportation costs, and helps optimize the movements in your warehouse. It can shorten the required delivery time.

Using cross-docking, you may have just a single movement in the warehouse: from the GR-zone into the GI-zone.

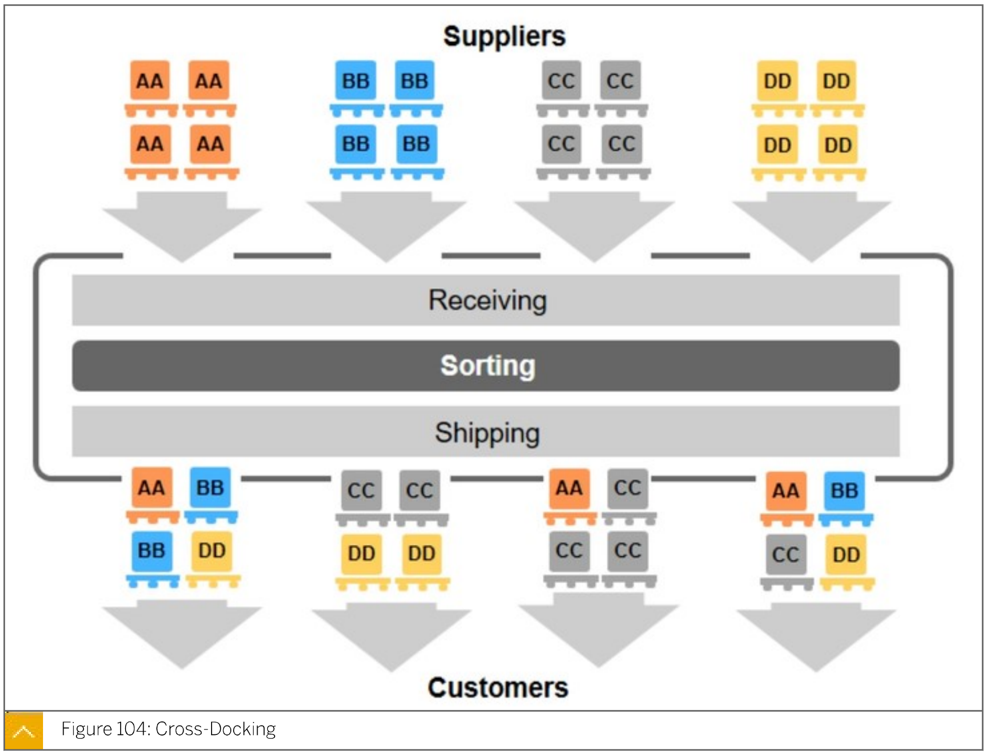


Figure 104: Cross-Docking

SAP differentiates between planned and opportunistic cross-docking. Five forms of cross-docking are available:

- Transportation cross-docking
- Merchandise distribution
- Push deployment
- Pick from goods receipt (PFGR)
- EWM-triggered opportunistic cross-docking

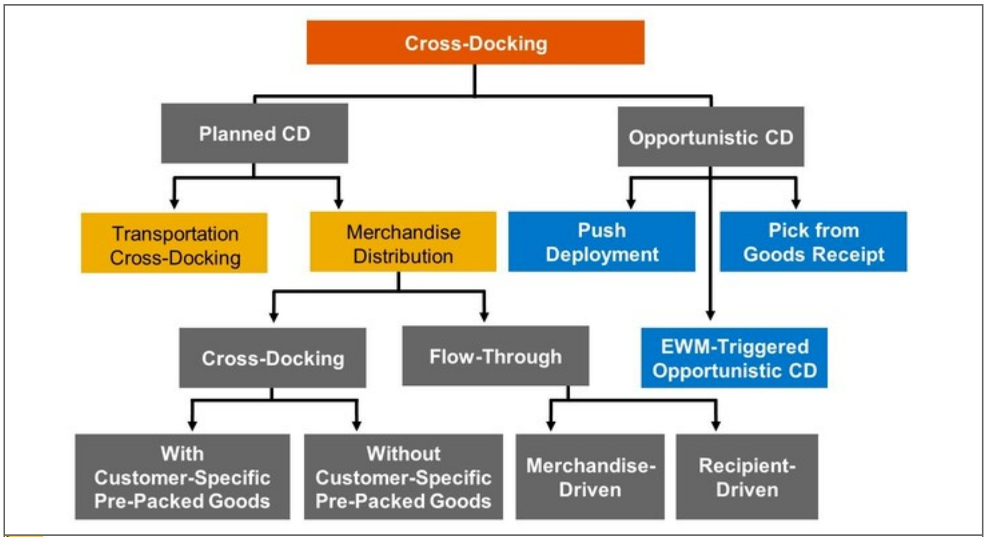


Figure 105: Cross-docking Scenarios in SAP EWM

Planned Cross-Docking

You must decide the cross-docking relevance before the products arrive in the warehouse and before you release the outbound delivery.

Transportation Cross-Docking

Transportation cross-docking (TCD) means that goods are not delivered directly from the delivering warehouse to a ship-to-party. Instead, the ordered goods are moved (with other purchased goods) to an interim warehouse and that is the cross-docking warehouse.

This is ideal if you have different warehouses in your company, which are on pre-defined routes and are supplied regularly with transports. It might not be ideal to transport the outbound delivery directly to the ship-to-party. It might be more logical to use a standard transport from one warehouse to another, and then deliver the customer order from the interim-warehouse. If the truck arrives in the interim cross-docking warehouse and is unloaded, the HU for the ship-to-party can be forwarded to the GI-zone. If the items are packed on a consolidated HU, you can use the process-oriented storage control to move the HU to the de-consolidation station, where it can be unpacked and repacked. From the de-consolidation station, the HU for the outbound delivery is moved to the GI-zone and the other HU is put away.

Cross-docking Routes

The decision to use transportation cross-docking is made during SAP EWM route determination for the outbound delivery order. Using this scenario, special cross-docking routes are required. These are the opposite of linear routes, which map the direct route from the delivery plant to the ship-to-party. Cross-docking routes are created for a specific location, and two linear routes (the incoming route and the outgoing route) are assigned to the cross-docking route.

As a result, two deliveries are created: an inbound delivery into the cross-docking warehouse and an outbound delivery from the cross-docking warehouse to the customer (the final ship-to-party). Both deliveries are assigned a TCD process-number. These deliveries are transferred to ERP and a transfer posting is made for the respective goods from the issuing storage location to a TCD storage location. The issuing plant retains ownership until the goods issue is posted for the outbound delivery of the final ship-to-party.

A variant of TCD is supplier cross-docking. In this case, the supplier sends the purchased goods to at least one cross-docking warehouse (instead of sending the goods directly to the receiving warehouse). The goal is to optimize transportation and keep deliveries in a single transport. As a prerequisite, you must use and develop a BAdI.

> Note:
> Transportation cross-docking is not possible in SAP S/4HANA embedded EWM, because there is no EWM route determination.

Merchandise Distribution

With merchandise distribution, you plan and control the flow of merchandise from a vendor through to a recipient. The merchandise can pass through a distribution center or, several distribution centers. The recipient is known at the time of procurement. Merchandise distribution is planned either using an allocation table (push) or a collective purchase order (pull). If the merchandise goes through a distribution center, three processing methods are possible:

- Cross-docking
- Flow-through
- Putaway

> Hint:
> To use merchandise distribution, the following are the prerequisites: SAP ERP 6.0 with EhP 4, Business Function Retail CD/FT_EWM Integration and Solution SAP Retail.

Merchandise Distribution Cross-Docking

The process starts in ERP. Based on customer orders or stock transport orders, you create collective purchase orders or stock transport orders. Customer orders or purchase orders are created based on an allocation table. In both cases merchandise distribution data is updated and ERP creates the inbound and (the planned) outbound deliveries, and then transfers them to SAP EWM.

After the physical goods arrive on the GR-zone, the goods are forwarded to the GI-zone and the goods issue is posted.

If the incoming goods are packed in a HU, you can use the process-oriented storage control for the internal movements. Merchandise distribution cross-docking is only possible when the delivered goods are forwarded directly to the ship-to-party.

Merchandise Distribution Flow-Through

When the HU that is received contains different products and the complete HU cannot be sent to the final ship-to-party, you must transfer the goods to a cross-docking storage type which is then used as a repacking area. You can repack based on the recipient or the product.

Recipient-Driven Flow-Through

After posting the goods receipt, and before creating the pick-warehouse task, the "quantity adjustment for the outbound delivery orders" is executed. (The menu path for this is: *EWM* → *Delivery Processing* → *Inbound Delivery* → *Merchandise Distribution: Maintain Quantity Adjustment Flow-Through*).

The HU received is moved to the cross-docking storage type where it is unpacked and re-packed in customer-specific pick HUs. Recipient-driven flow-through means that the picker takes a customer specific pick-HU and packs the required products into that pick-HU. For each ship-to-party, an individual warehouse order is created to transfer the appropriate pick HU to the GI-zone.

Product-Driven Flow-Through

The difference with the product-driven flow-through is in the way that the picker packs the pick-HU. With product-driven flow-through, the picker prepares for product-specific HUs in advance and sends the products of each delivered HU to the product-specific handling unit. Completing the process step for the HU creates a warehouse task to transfer the pick-HUs to the GI-zone.

Opportunistic Cross-Docking

After the goods receipt posting or after the outbound delivery release, the cross-docking decision is made. Three methods of opportunistic cross-docking exist:

- EWM-triggered opportunistic cross-docking
- Pick from goods receipt (PFGR)
- Push deployment (PD)

EWM-triggered Opportunistic Cross-docking

This is the only cross-docking method that does not need another application or system (such as ERP, APO, or CRM) for the cross-docking decision. This method is controlled by the product itself. It uses product groups and product group types assigned to the product master data. Additionally, it is necessary to activate a BAdI controlling the inbound respectively the outbound cross-docking.

During the creation of a putaway warehouse task, SAP EWM searches for a matching item in outbound delivery orders. If the required product, batch, and quantity is suitable, existing picking warehouse tasks can be deleted. If no warehouse tasks exist, SAP EWM creates new cross-docking warehouse tasks. Incoming goods are not putaway, but are directly transferred to the GI-zone. If the delivered quantity is greater than the required quantity, the remaining quantity is stored.

The process also works in the converse way, that is, when creating picking warehouse tasks, the respective BAdI checks if there is stock in the GR-zone that can be used instead of using stored stock.

To avoid inconsistencies, it is necessary to work in an RF environment. Using printed warehouse tasks, you cannot use EWM-triggered opportunistic cross-docking.

> Hint:
> EWM-triggered opportunistic cross-docking has prerequisites. You must implement the Business Add-Ins (BAdIs):
>
> - /SCWM/EX_CD_OPP_INBOUND (Activate and Adjust the Inbound-triggered Cross-docking Process)
> - /SCWM/EX_CD_OPP_OUTBOUND (Activate and the Adjust Outbound-triggered Cross-docking Process)
>
> For both BAdIs, a sample implementation is available.

Push Deployment (PD) and Pick From Goods Receipt (PFGR)

PD is used for forecasted demands in other locations. PFGR is used for overdue customer orders and overdue stock transport orders. The usage is controlled by customizing the putaway delay setting. In this setting, you define a wait time for each warehouse process type and assigned stock type. This wait time is intended to delay the automatic creation of warehouse tasks.

The process starts with standard inbound deliveries and a standard goods receipt process. SAP EWM checks if the warehouse process type and stock type is relevant for the putaway delay. The goods receipt posting is transferred to SAP ERP and SAP APO. While the creation of putaway warehouse tasks is delayed by the defined time (putaway wait time delay), SAP APO checks if either forecasted demands in other locations or overdue SD-orders or overdue stock transport orders exist. If any of those exist, then SAP APO initiates an ERP-created outbound delivery for the respective demands or orders and transfers those outbound deliveries to SAP EWM. If the putaway wait time delay has passed, putaway warehouse tasks are created. In this case, since outbound deliveries for cross-docking exist, the goods are transferred directly to the GI-zone.

If you manually create warehouse tasks for putaway during the wait time, you receive a warning message. Ignoring the message means that you override the cross-docking process.

Using Push Deployment and PFGR is only possible in the integrated environment of SAP ERP, SAP APO, SAP CRM and SAP EWM.

LESSON SUMMARY

You should now be able to:

- Use cross-docking

Unit 6

Learning Assessment

1. What can you do with a wave?

   Choose the correct answers.

   ☐ A Release the wave to create the warehouse task
   ☐ B Add or remove items
   ☐ C Post the goods issue
   ☐ D Delete the wave

2. The following list suggests some of the ways in which waves can be processed. Determine which one is incorrect:

   Choose the correct answer.

   ☐ A Locked
   ☐ B Released.
   ☐ C Deleted
   ☐ D Split
   ☐ E Shared

3. With Labor Management active, you must manually enter end times in work center related transactions.

   Determine whether this statement is true or false.

   ☐ True
   ☐ False

4. With Labor Management active, the labor utilization node is usable in the warehouse management monitor.

   Determine whether this statement is true or false.

   ☐ True
   ☐ False

5. When entering master data in Labor Management, the processor's role in a group can be defined by selecting relationships.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

6. Which two of the following types of labor time are tracked in Labor Management?

   Choose the correct answers.

   ☐ A Direct Labor

   ☐ B Indirect Labor

   ☐ C Unproductive Time

   ☐ D Scheduled Time

7. Which of the following data must you enter when processing a document (such as a warehouse order) where the activity is connected with a Labor Management process step?

   Choose the correct answers.

   ☐ A Start time

   ☐ B Finish time

   ☐ C Material

   ☐ D Processor

   ☐ E Warehouse number

8. For planning in Labor Management, you need active warehouse tasks.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

9. When staging products for a production order with delivery-based production integration, three types of staging are available. What are they?

   Choose the correct answers.

   ☐ A Pick Parts

   ☐ B HU Parts

   ☐ C Release Order Parts

   ☐ D Crate Parts

10. In an environment where two separate warehouse are involved, production supply is done by posting change.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

11. You can use the expected goods receipt as a preview of the goods receipt.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

12. Match the Cross-Docking types to their description:

Match the item in the first column to the corresponding item in the second column.

Transport Cross-Docking
Merchandise Distribution
Merchandise Distribution Flow-through
Recipient driven flow-through

Plan and control the flow of merchandise from a vendor through to a recipient.
Picker takes a customer-specific pick-HU and packs the required products into that pick-HU. For each ship-to-party, an individual warehouse order is created to transfer the appropriate pick HU to the GI-Zone.
When the HU received contains different products and the complete HU can not be sent to the final ship-to-party, you must transfer the goods to a cross-docking storage type (which is used as a repacking area).
Goods are not delivered directly from the delivering warehouse to a ship-to-party.

Unit 6

Learning Assessment - Answers

1. What can you do with a wave?

   Choose the correct answers.

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2. The following list suggests some of the ways in which waves can be processed. Determine which one is incorrect:

   Choose the correct answer.

   ☐ A Locked

   ☐ B Released.

   ☐ C Deleted

   ☐ D Split

   ☒ E Shared

   Correct. Waves can be processed in a number of ways. Waves can be locked, unlocked, merged, released, deleted and split.

3. With Labor Management active, you must manually enter end times in work center related transactions.

   Determine whether this statement is true or false.

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4. With Labor Management active, the labor utilization node is usable in the warehouse management monitor.

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   ☒ True

   ☐ False

6. Which two of the following types of labor time are tracked in Labor Management?

   Choose the correct answers.

   ☒ A Direct Labor

   ☒ B Indirect Labor

   ☐ C Unproductive Time

   ☐ D Scheduled Time

   Correct. Two basic types of labor time are tracked in Labor Management. They are direct labor and indirect labor.

7. Which of the following data must you enter when processing a document (such as a warehouse order) where the activity is connected with a Labor Management process step?

   Choose the correct answers.

   ☒ A Start time

   ☒ B Finish time

   ☐ C Material

   ☒ D Processor

   ☐ E Warehouse number

8. For planning in Labor Management, you need active warehouse tasks.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False

9. When staging products for a production order with delivery-based production integration, three types of staging are available. What are they?

   Choose the correct answers.

   ☒ A Pick Parts

   ☐ B HU Parts

   ☒ C Release Order Parts

   ☒ D Crate Parts

   Correct. When staging products for a production order or process order, the products are transported to the Production Supply Area (PSA). The three types of staging available are: Pick Parts, Release Order Parts, and Crate Parts.

10. In an environment where two separate warehouse are involved, production supply is done by posting change.

    Determine whether this statement is true or false.

    ☐ True

    ☒ False

11. You can use the expected goods receipt as a preview of the goods receipt.

    Determine whether this statement is true or false.

    ☒ True

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Plan and control the flow of merchandise from a vendor through to a recipient.
When the HU received contains different products and the complete HU can not be sent to the final ship-to-party, you must transfer the goods to a cross-docking storage type (which is used as a repacking area).
Picker takes a customer-specific pick-HU and packs the required products into that pick-HU. For each ship-to-party, an individual warehouse order is created to transfer the appropriate pick HU to the GI-Zone.

UNIT 7 Warehouse Extensions

Lesson 1

Planning the Shipping and Receiving of Products 178

Lesson 2

Controlling the Material Flow System (MFS) 188

UNIT OBJECTIVES

- Describe shipping and receiving
- Use yard management
- Use the shipping cockpit and dock appointment scheduling
- Integrate transportation planning systems
- Describe the Material Flow System (MFS)

Unit 7
Lesson 1

Planning the Shipping and Receiving of Products

LESSON OVERVIEW

This lesson describes shipping and receiving. At the end of this lesson, you will know how to use yard management, use the shipping cockpit and dock appointment scheduling, and integrate transportation planning systems.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Describe shipping and receiving
- Use yard management
- Use the shipping cockpit and dock appointment scheduling
- Integrate transportation planning systems

Shipping and Receiving

Shipping and receiving describe the processes that are used to plan and execute processes for your materials coming into the warehouse or leaving the warehouse. Shipping and receiving in SAP EWM covers the following areas:

- Usage of vehicles and transportation units for managing the transports to or from your warehouse
- Loading and unloading, including docking at, or undocking from the door
- Yard Management

Shipping and receiving is also used to integrate SAP EWM with other transportation planning tools available in SAP ERP or SAP TM.

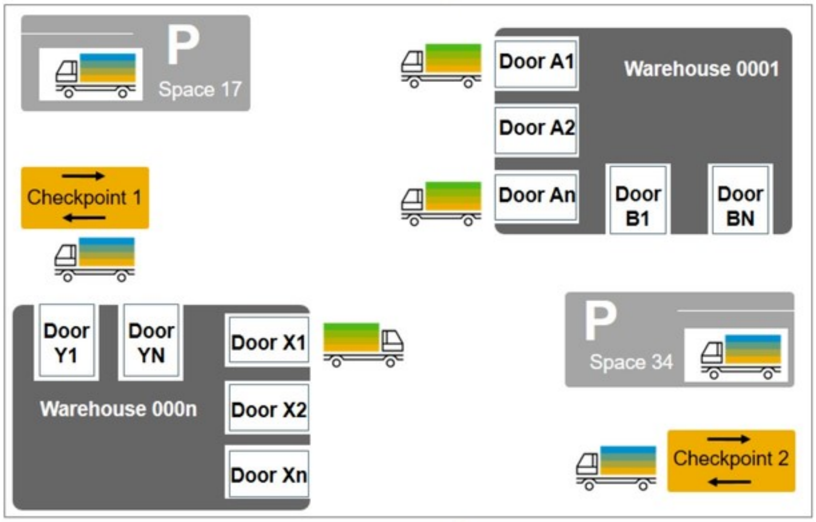


Figure 106: Yard Management

Overview of Yard Management

The yard is an enclosed area outside a warehouse where vehicles and transportation units are dealt with, waiting to be dealt with, or waiting to be collected by an external carrier. You can use a yard with basic functions (to control the arrival, unloading or loading, and the leaving of trucks) or with full blown functions (to control the individual movements of trucks). This is called yard management.

Yard Management Setup

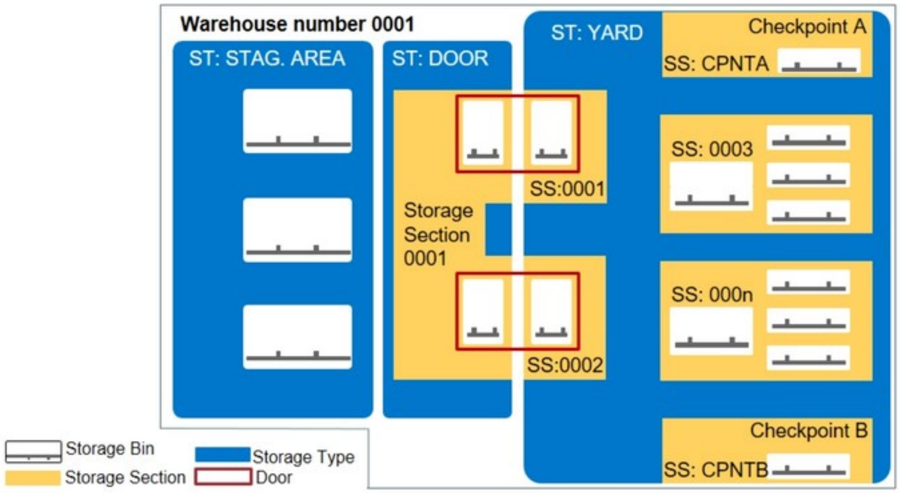


Figure 107: Yard Setup

A yard is represented by a separate storage type in a warehouse. However, you can also configure it with a separate warehouse number, which must then include a storage type that has the role Yard. In both cases, you can use one yard for multiple warehouses. Conversely, you can define a warehouse with multiple yards.

Yard Structure

You map the corresponding storage bins as yard bins, which you can group into yard sections, as in the warehouse. The following structures are possible in a yard:

- Parking spaces

  A position in the yard where a vehicle or a transportation unit (TU) is parked.

- Checkpoints

  A location where vehicles and TUs enter or exit the yard. This can represent a physical gate at the yard entrance, or a virtual gate from which data is transmitted electronically.

- Doors

  A location in the warehouse where goods arrive or leave. The door is an organizational unit that you assign to the warehouse number. It connects the yard to the warehouse. Vehicles and their TUs drive up to the doors of a warehouse to load or unload goods. The doors are in close proximity to the relevant staging areas; you make an assignment between staging areas and doors.

Vehicles and Transportation Units

In the yard, you move vehicles or transportation units.

A vehicle is a specialization of a particular means of transport. A vehicle can comprise one or more transportation units and represents the physical entity of the transport vehicle.

A transportation unit is the smallest loadable unit of a vehicle that is used to transport goods.

The TU can be a fixed part of the vehicle. The figure, Vehicles and Transportation Units, shows different TUs:

- Vehicle 1: Semi-trailer truck, which equals one TU
- Vehicle 2: Truck with cargo area and trailer, which equals two TUs
- Vehicle 3: Train with four wagons, which equals four TUs

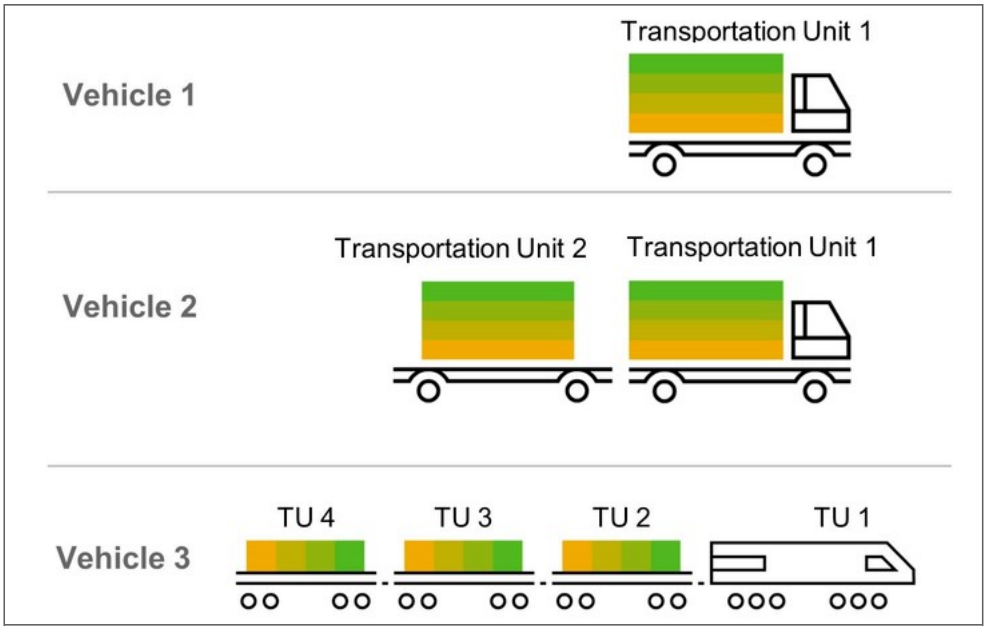


Figure 108: Vehicles and Transportation Units

It is not mandatory to use vehicles in shipping and receiving if the features available at transportation unit level are sufficient for your transportation processes.

In shipping and receiving, there are several ways to create transportation units or vehicles, as the following list outlines:

- You can create them manually through the transactions in SAP EWM.
- They can be created automatically through receiving the information as part of the inbound or outbound delivery from ERP.
- You can use the shipping cockpit for outbound planning for the creation of transportation units and assignment of outbound delivery orders.
- Transportation planning in SAP TM or ERP (LE-TRA) can create transportation units or vehicles to send the transportation planning information to SAP EWM.

Yard Movements

Yard movements enable you to move TUs from one yard bin to another inside a yard. Examples of yard movements are as follows:

- The TU arrives at the checkpoint and is moved to a parking space or to a door.
- You move a TU from a parking space to the door, or from the door to a parking space.
- You move a TU from one parking space to another, or from one door to another.

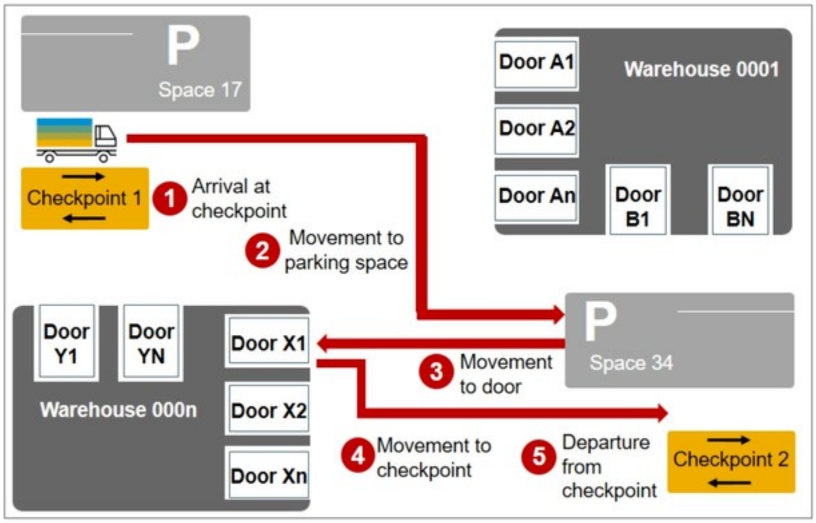


Figure 109: Movements in the Yard

Arrival at or Departure from a Checkpoint

The checkpoint is where you register the vehicles and TUs that enter or exit the yard. You can perform this task by setting the status for the arrival at the checkpoint or departure from the checkpoint. This is a prerequisite for yard movements.

Moving Transportation Units in the Yard

It is only with the activation of Yard Management that it is also possible to move a TU in the Yard. Without Yard Management, you just record the arrival and departure of a TU at a checkpoint or a door.

Each time you want to move a TU in the yard, you have to create a Warehouse Task (WT) manually. To do this, you use a special transaction to create WTs in the yard. You can also create and execute yard movements in a radio frequency (RF) environment.

Transportation Units and Deliveries

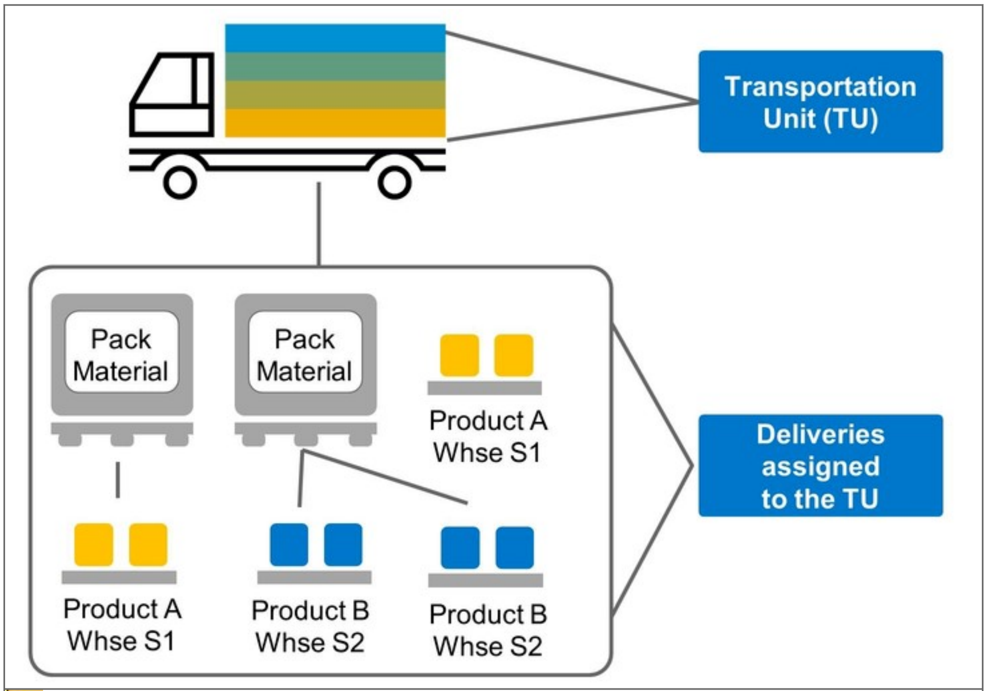


Figure 110: Transportation Units and Deliveries

You assign deliveries to transportation units. This can happen manually during or after the creation of the TU. It can also happen automatically when the TU information is already in the document coming from ERP. In this case, the TU creation and the assignment of the deliveries happens in the background.

Yard Logistics

While not every customer needs extensive processes in the yard, others may require planning and monitoring features in addition to those provided by SAP EWM yard management. The *SAP Yard Logistics* solution provides check-in to check-out support for transportation units and is focused on the functionalities of planning, execution, yard operations, yard monitoring and billing. It is based on the structures used in SAP EWM, so it can be used as part of your SAP EWM warehouse, or standalone, for example in a container terminal.

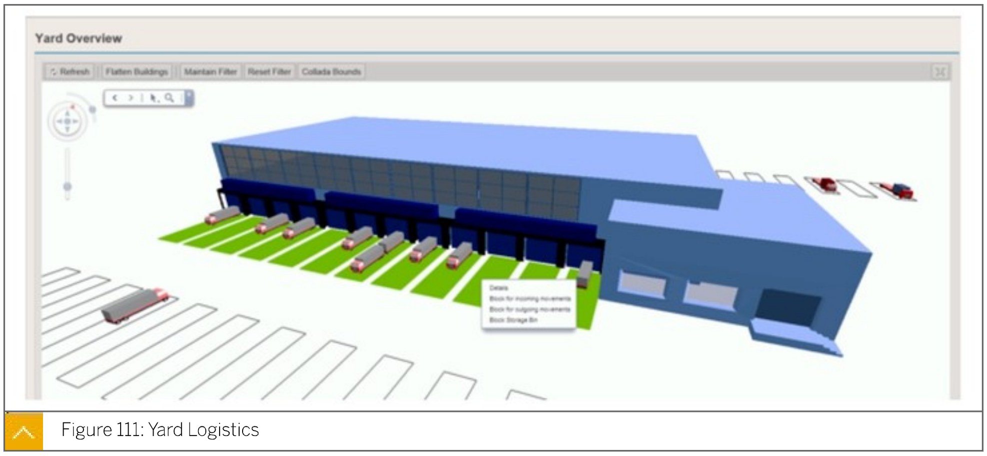


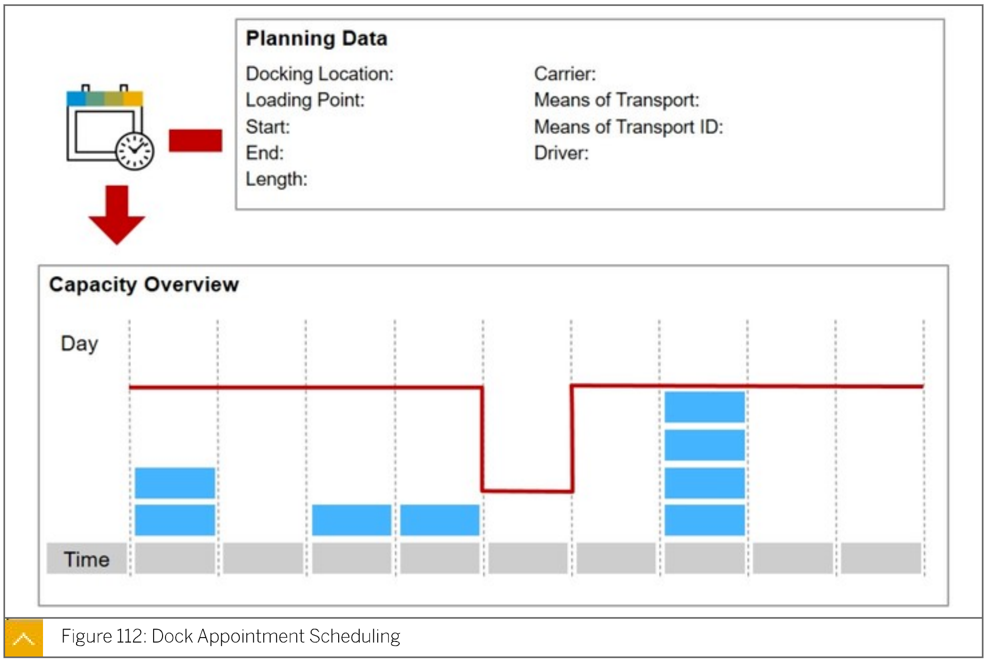
Figure 111: Yard Logistics

SAP Dock Appointment Scheduling

You can use SAP Dock Appointment Scheduling (DAS) to plan vehicle arrivals in your warehouses efficiently and to collaborate with the parties associated with an appointment.

You can use SAP DAS to schedule loading appointments for loading and unloading vehicles and to get an overview of the workload of a loading point for each day.

Carriers with access to the system can plan loading appointments for their own vehicles directly in the system and update details of their loading appointments.



Planning Data

Docking Location:
Loading Point:
Start:
End:
Length:
Carrier:
Means of Transport:
Means of Transport ID:
Driver:

Capacity Overview

Figure 112: Dock Appointment Scheduling

Deployment Options

SAP Dock Appointment Scheduling can be deployed standalone or integrated with a SAP EWM or SAP Yard Logistics system.

Appointment Planning

You plan loading appointments for vehicles in collaboration with the carriers, and process the loading appointments in the system. As the loading appointment proceeds, the system records the time of each status change for later analysis.

The system can determine the loading point of a loading appointment automatically, based on properties of the loading appointment and loading points. For example, if you have a loading appointment for a delivery of frozen goods, and a designated loading point for frozen goods, the system can automatically determine that the loading appointment should be planned for the loading point for frozen goods.

The system can also determine the duration of a loading appointment automatically, based on the number of packages in the loading appointment, the duration per package, and the amount of offset time a vehicle needs at the dock for activities such as arriving at the dock. For example, for a specific loading point, you can define that unloading 1 package takes 2 minutes, and that you require an offset of 10 minutes for each loading appointment. Using these definitions, the system calculates 30 minutes for a loading appointment with 10 packages to unload.

Collaboration with Carriers

For a carrier, planning is important to reduce the amount of time a vehicle is not available for use, for example, when it is waiting to be unloaded.

You can allow appointment planners for carriers to plan appointments directly in the system by creating business partner roles for them. This means that the carriers can accurately plan for their vehicles, which results in more accurate scheduling for the warehouse. The appointment planners for carriers can display their own carrier's appointments only.

To Activate SAP DAS Integration

If SAP DAS should be used together with SAP EWM, the integration has to be activated.

1. On the EWM *Index* screen, choose *Extended Warehouse Management → Interfaces → Dock Appointment Scheduling → Integration Settings for SAP EWM*.
2. On the *Change View "Integration Settings EWM to Dock Appointment Scheduling"* screen, select the checkbox for **Whse No.** E100 and **Inbound TU Integration**
3. Choose *Save*.
4. On the *Prompt for customizing request* pop-up, choose *Create Request*.
5. Enter the *Short Description* **`DAS Integration`** and choose *Save*.
6. Choose *Continue*.
7. Choose *Back* to return to the *Index*.

Now, the SAP EWM-DAS Integration is active.

Shipping Cockpit

The Shipping Cockpit offers a user-centric UI for the shipping office clerk to do the following activities:

- Plan shipping activity outbound deliveries

- Execute tasks
- Monitor outbound operations in the warehouse

Recurring tasks can also be automated and controlled in the Shipping Cockpit.

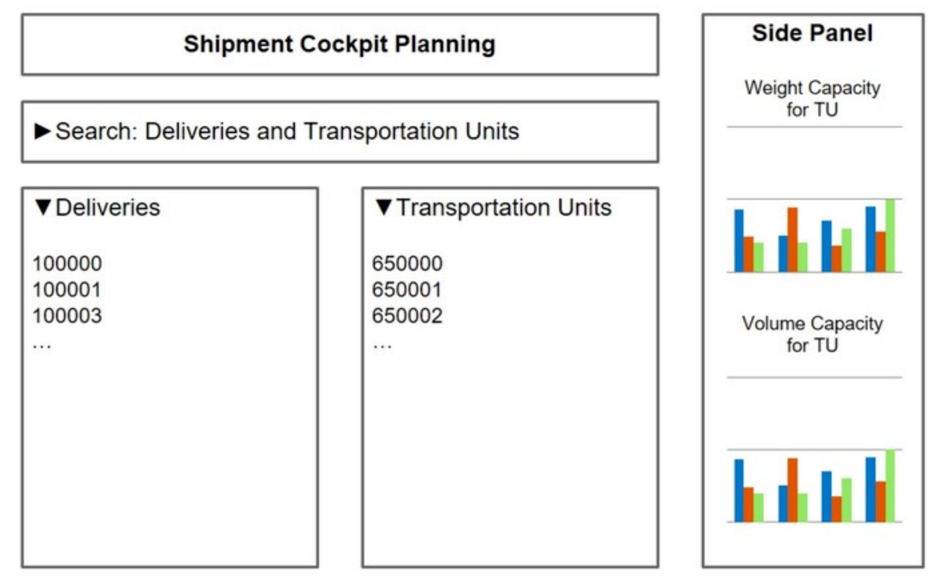


Figure 113: Shipping Cockpit

Integration of Transportation Planning Systems

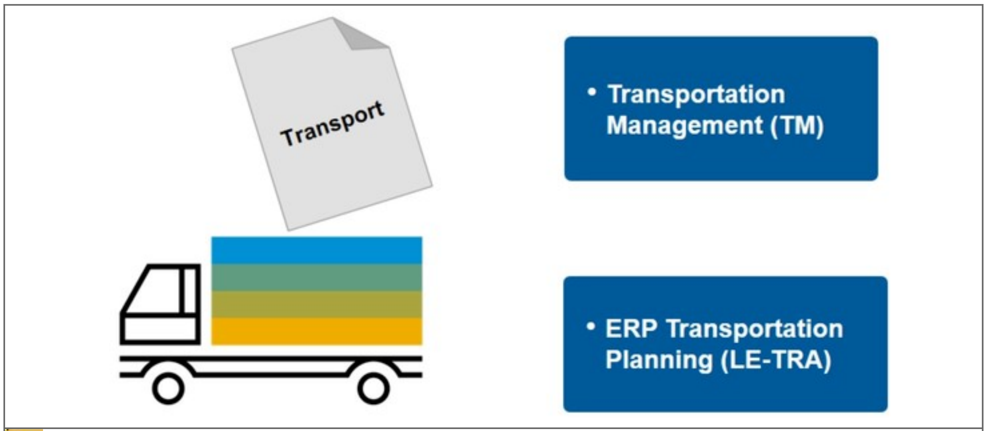

Transport
• Transportation Management (TM)
• ERP Transportation Planning (LE-TRA)

Figure 114: Planning Transportation

While SAP EWM includes basic planning functionality to combine deliveries for transportation, SAP offers other, more advanced tools for transportation planning with SAP ERP (LE-TRA) and SAP Transportation Management (TM). When you plan transportation with these tools, the result is represented as a transportation unit in SAP EWM. Conversely, a transportation unit can also be used to send initial transportation information to LE-TRA or SAP TM.

LESSON SUMMARY

You should now be able to:

- Describe shipping and receiving
- Use yard management
- Use the shipping cockpit and dock appointment scheduling
- Integrate transportation planning systems

Unit 7
Lesson 2

Controlling the Material Flow System (MFS)

LESSON OVERVIEW

This lesson describes the characteristics of the material flow system (MFS) that manages and controls physical movements in the warehouse.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Describe the Material Flow System (MFS)

Basics of the MFS

While SAP EWM mainly automates the strategic and planning functions in the warehouse, the material flow system (MFS) manages and controls the physical movements. Along with complete integration, the advantage of MFS in SAP EWM is that it removes the need for interfaces to external systems or additional warehouse control units because SAP EWM communicates directly with the control level.

Incoming or outgoing handling units (HUs) are physically moved on conveyor belts, or automatic storage or retrieval systems. They pass on their way to different communication points, where they are identified and moved to further destinations, for example:

- A high-rack storage bin
- A pick point (if only a partial quantity of a HU is to be delivered)

The physical transportation on conveyor technology is controlled by an underlying controller called the programmable logic controller (PLC). The PLC also controls the communication between SAP EWM and the MFS. The PLC evaluates signals from the connected automatic storage or retrieval system, conveyor system, or other systems, and activates or deactivates the connected motors, appliances, sensors, readers, and so on.

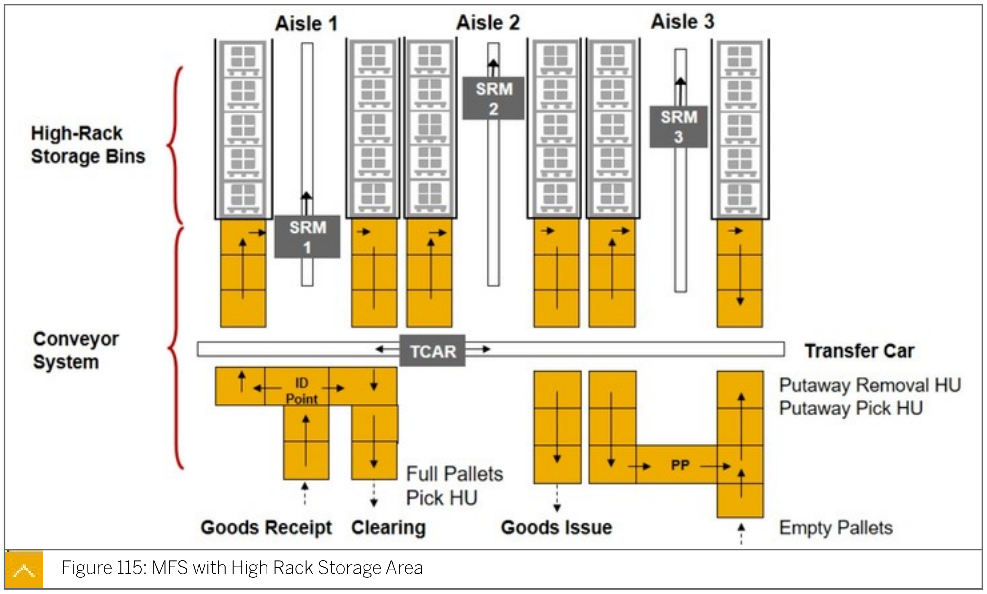


Figure 115: MFS with High Rack Storage Area

MFS Components

When setting up a material flow system (MFS), you need to define a warehouse layout for MFS. The MFS requires common warehouse objects such as:

- Storage Types
- Storage Bins
- Resources (even in MFS, a HU is located in a storage bin or on a resource)

As well as these requirements, an MFS requires additional objects. The point where EWM and PLC communicate is called the communication point, and it is assigned to a PLC. Common communication points are I-points (identification point) or scanner points. If a HU arrives at an I-Point, it is scanned and the PLC sends a message with the relevant information to SAP EWM. This message is called a telegram.

Based on the information received in the telegram, SAP EWM can start the next action (for example, storage bin determination) and SAP EWM returns a telegram to the PLC to transport the HU to the next communication point. Based on this telegram, the PLC controls the MFS to move the HU to the respective destination. Arriving at this communication point, the HU is identified again and depending on the communication point type, the next telegram and a resulting action is triggered.

Configuring the MFS ensures that the telegrams are sent in the correct sequence. This is to avoid a situation where, for example the system tries to execute step 2 before step 1. At least one communication channel must be defined for each PLC. This communication channel is for telegram-transmission between MFS and the PLC. It controls the length of a message, the time and number of recurrences, and the Handshake-mode (which defines if a PLC confirms the receipt of a telegram and how it does so). If a communication point cannot identify a HU, that HU should be transferred to a Clarification Point where a warehouse employee can resolve the problem.

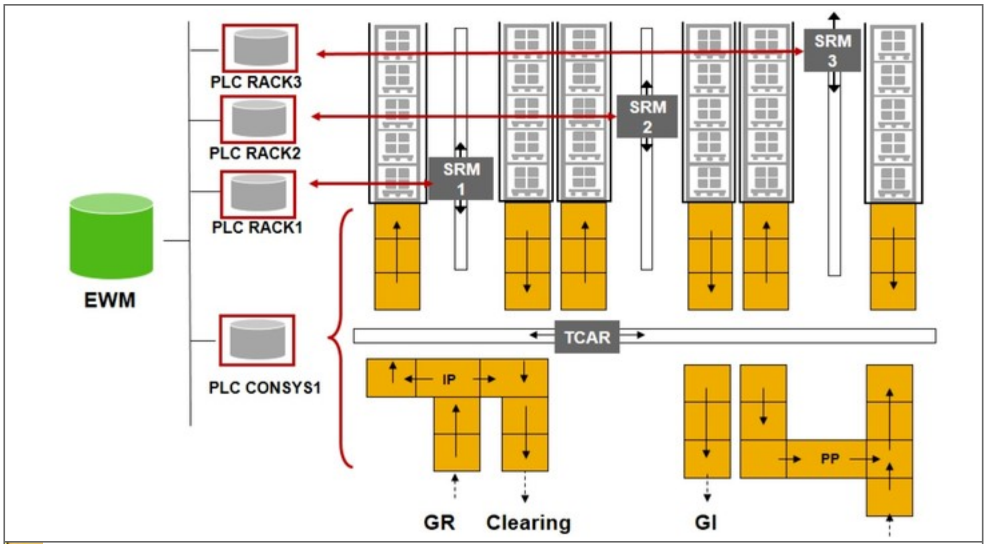


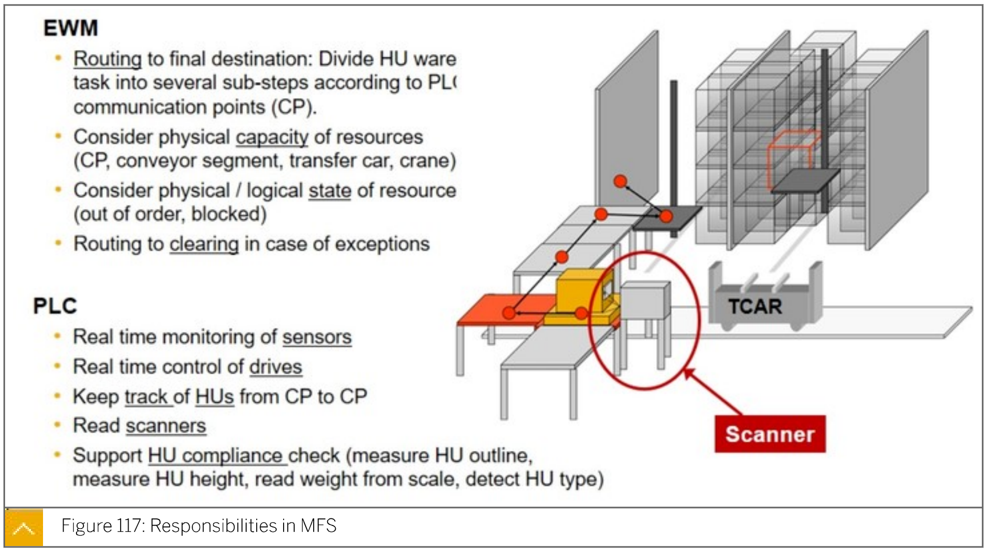
Figure 116: MFS Components

Movements with MFS

The distance between two communication points can be modelled as a conveyor segment (conveyor element). This is where HUs are transported physically. As in the settings of the communication points and resources, you can define the capacity limit per conveyor segment, for example, you define the number of HUs that are currently transported on this segment. If the capacity limit is exceeded, SAP EWM holds further orders for this element. To transport the HU from one communication point to another, resources may be required. If the distance between two communication points requires a stacker crane (to transport that HU), then that stacker crane can be modeled as a resource.

To transport HUs, SAP EWM generates warehouse tasks and warehouse orders and sends them in a respective queue. In the MFS, each warehouse order has exactly one warehouse task assigned.

Putaway and Picking with MFS



EWM

- Routing to final destination: Divide HU ware task into several sub-steps according to PL communication points (CP).
- Consider physical capacity of resources (CP, conveyor segment, transfer car, crane)
- Consider physical / logical state of resource (out of order, blocked)
- Routing to clearing in case of exceptions

PLC

- Real time monitoring of sensors
- Real time control of drives
- Keep track of HUs from CP to CP
- Read scanners
- Support HU compliance check (measure HU outline, measure HU height, read weight from scale, detect HU type)

Figure 117: Responsibilities in MFS

As in the example, one could set up layout-oriented storage control and MFS to process the inbound deliveries as follows:

1. A handling unit (HU) arrives and the goods receipt is posted.
2. SAP EWM determines the final storage bin and creates the correspondent warehouse task and warehouse order. Layout-oriented storage control is taken into account and substitutes the determined storage bin by the first communication point.
3. The HU is moved to the communication point, in this case, the I-Point.
4. At the I-Point, the HU is scanned and the system determines (again) the final storage bin.

As before, layout-oriented storage control intervenes and determines that the HU is to be transported to another communication point. At this communication point, the HU must be moved to a transfer car that takes the HU to the next communication point. At the last communication point, layout-oriented storage control determines that the HU is to be moved to the final storage bin and therefore a stacker crane is required. The warehouse task for putaway is re-activated and assigned to the respective queue for the stacker crane. The HU is moved to the stacker crane and put away in the storage bin in the high-rack storage area. By confirming this warehouse task, the process is finished.

LESSON SUMMARY

You should now be able to:

- Describe the Material Flow System (MFS)

Unit 7

Learning Assessment

1. In a yard, which of the following entities can you have?

   Choose the correct answers.

   ☐ A Transportation units
   ☐ B Vehicles
   ☐ C Containers

2. Which of the following are ways that you can represent a yard in SAP EWM?

   Choose the correct answers.

   ☐ A A physical location or address
   ☐ B A storage type with the role yard in the warehouse
   ☐ C A storage type with an unspecified role
   ☐ D A separate warehouse number that includes a storage type with the role yard
   ☐ E A storage section

3. A transportation unit is the term used to describe a vehicle, such as a truck.

   Determine whether this statement is true or false.

   ☐ True
   ☐ False

4. What are the three components to yard management:

   Choose the correct answers.

   ☐ A Yard Movements
   ☐ B Yard Monitoring
   ☐ C Yard Location Management
   ☐ D Yard Stock

5. The SAP EWM integration to transportation planning in ERP is possible in which of the following scenarios:

   Choose the correct answer.

   ☐ A Only for inbound

   ☐ B Only for outbound

   ☐ C For inbound and outbound

6. Which of the following might a "yard" storage bin represent?

   Choose the correct answers.

   ☐ A Parking space

   ☐ B Checkpoint

   ☐ C Manufacturing line

   ☐ D Door

Unit 7

Learning Assessment - Answers

1. In a yard, which of the following entities can you have?

   Choose the correct answers.

   ☒ A Transportation units
   ☒ B Vehicles
   ☐ C Containers

2. Which of the following are ways that you can represent a yard in SAP EWM?

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   ☐ C A storage type with an unspecified role
   ☒ D A separate warehouse number that includes a storage type with the role yard
   ☐ E A storage section

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   Determine whether this statement is true or false.

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   ☒ False

4. What are the three components to yard management:

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   ☒ C Yard Location Management
   ☒ D Yard Stock

5. The SAP EWM integration to transportation planning in ERP is possible in which of the following scenarios:

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   Choose the correct answers.

   ☒ A Parking space
   ☒ B Checkpoint
   ☐ C Manufacturing line
   ☒ D Door

UNIT 8 SAP Best Practices

Lesson 1

Accelerating Implementation Processes 197

UNIT OBJECTIVES

- Accelerate implementation processes

Unit 8
Lesson 1

Accelerating Implementation Processes

LESSON OVERVIEW

This lesson outlines how you can accelerate implementation processes using SAP EWM best practice scenarios.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Accelerate implementation processes

SAP Best Practices

When analyzing the warehousing processes of our customers, a high degree of complexity and variations surface. This degree of variations comes from the differences between the processes running in the warehouse and variations that may occur over time. For example, the manual (performed by people) and automated (performed by machines) processes in a warehouse are subject to change. Furthermore, automation becomes a critical element within a warehouse, because the automated processes and tools need to be controlled and efficiently manipulated.

In the end, it is essential to have a functional warehouse system that covers the requirements of the processes that are needed by a company. Furthermore, it is important not to spend too much time and effort to set up the warehouse and the IT system of the warehouse. The return on investment (ROI) can only be realized after the warehouse becomes productive, and not in the time-frame when the warehouse is being built or the IT project is in development.

SAP Best Practices (also known as, SAP Rapid Deployment Solutions, SAP RDS) packages respond to the issues and needs of our customers. For SAP EWM, customers are able to choose from defined core warehousing processes based on their requirements, and quickly adapt them to their company structure and resource utilization.

In turn, customers see improved on-time shipment completion, a reduction in the product availability time-line, better inventory accuracy, better visibility of the warehouse, and a better ratio of costs as percentage of gross sales.

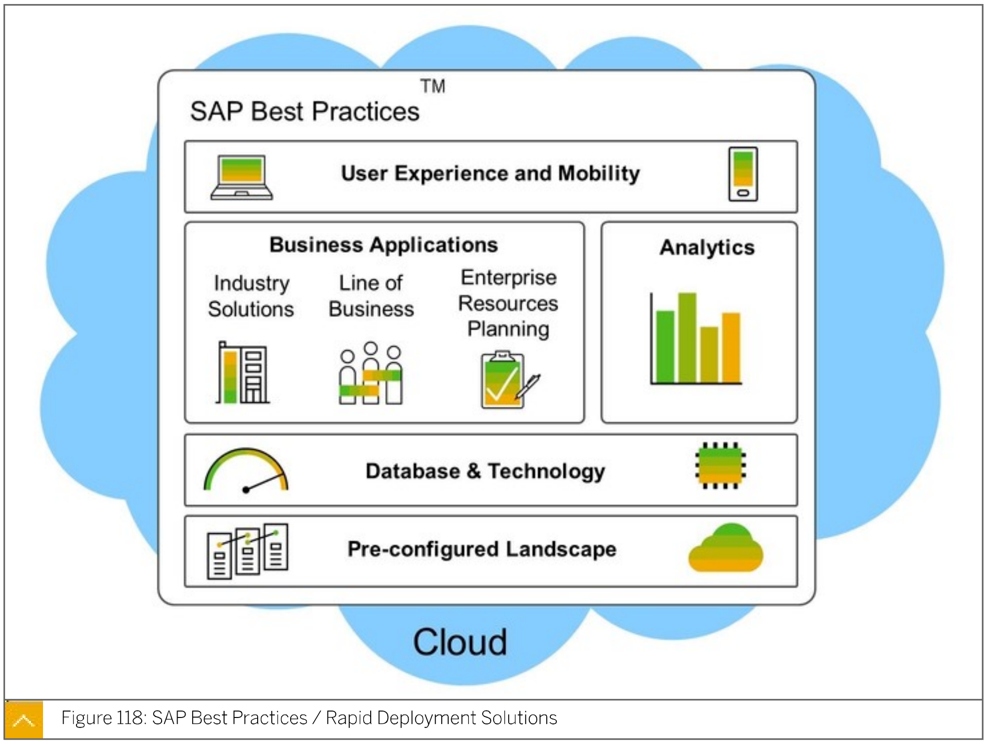

Figure 118: SAP Best Practices / Rapid Deployment Solutions

Benefits of SAP EWM Rapid Deployment Solutions or SAP Best Practices for SAP S/4HANA (On Premise)

The SAP EWM rapid-deployment solutions and the SAP Best Practices for SAP S/4HANA (on premise) include several building blocks. One component can quickly connect an SAP ERP system to an SAP EWM system, helping to efficiently launch an implementation project. It combines rapid automation with accurate documentation to provide you with the information you need to effectively implement this critical and fundamental process. The sample warehouse structure process provides a starting point, offering a sample warehouse structure with the convenience of automated modifications for setting up a specific warehouse using a specific layout and physical elements.

Core processes for inbound, outbound, and internal processes that have some variations within the building blocks of rapid-deployment solutions, are also included.

SAP Best Practices ensures rapid deployment, and consequently reduced total cost of implementation. Because it is pre-configured, training and hands-on experience can start almost at first customer contact. The solution offers simple and smooth automation of SAP EWM processes, and although it is pre-defined, it offers a great deal of flexibility when choosing the required functionality.

LESSON SUMMARY

You should now be able to:

- Accelerate implementation processes

Unit 8

Learning Assessment

1. The SAP EWM Rapid Deployment Solution is only available for customers with an active EWM implementation.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

Unit 8

Learning Assessment - Answers

1. The SAP EWM Rapid Deployment Solution is only available for customers with an active EWM implementation.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False

UNIT 9

Combined Inbound and Outbound Processes

Lesson 1

Executing an End-to-End Process with SAP EWM 202

UNIT OBJECTIVES

- Execute an end-to-end process

Unit 9
Lesson 1

Executing an End-to-End Process with SAP EWM

LESSON OVERVIEW

In this lesson, you learn how to execute an end-to-end process with SAP EWM.

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Execute an end-to-end process

SAP EWM End-to-End Process

In this course, you have seen a lot of the possibilities that SAP Extended Warehouse Management (EWM) has to offer. SAP WM / SAP Stock Room Management is a valid alternative for smaller warehouses or warehouses with simple putaway and picking processes. However, for warehouses with complex processes and a demand for high availability, SAP EWM is the better choice. Also, with the end of support for SAP WM, customers need to plan the transition to SAP EWM for existing decentral warehouses.

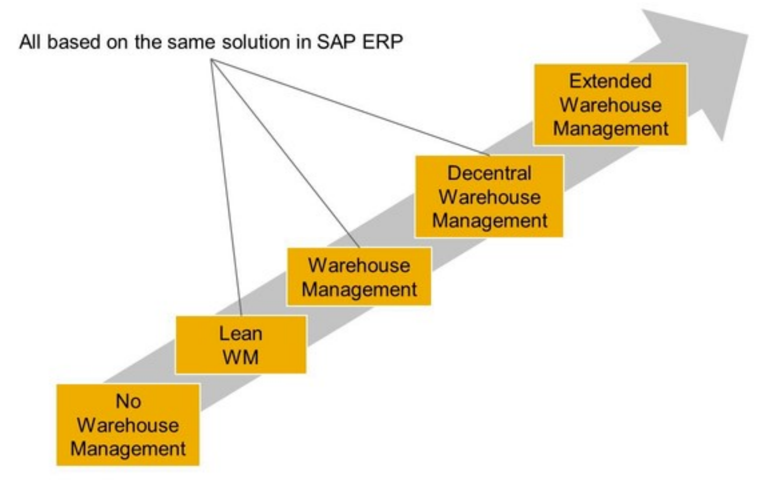
All based on the same solution in SAP ERP
No Warehouse Management
Lean WM
Warehouse Management
Decentral Warehouse Management
Extended Warehouse Management

Figure 119: SAP Warehouse Management Solutions

SAP EWM provides flexible, automated support for processing goods movements and managing stock in your distribution facilities, both locally and as a single, integrated entity. It is a native, built-in warehouse control application that integrates with other enterprise software used to centrally manage your business, such as the SAP ERP application. You no longer need multiple warehouse control systems to manage geographically-distributed warehouses.

SAP EWM is not only suitable for companies storing their own material, but also for logistics service providers who need a solution to support the entire value chain, from order entry and fulfillment, to the billing of services.

LESSON SUMMARY

You should now be able to:

- Execute an end-to-end process

Unit 9

Learning Assessment

1. SAP EWM integrates easily with other enterprise software applications.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

Unit 9

Learning Assessment - Answers

1. SAP EWM integrates easily with other enterprise software applications.

   Determine whether this statement is true or false.

   ☒ True

   ☐ False